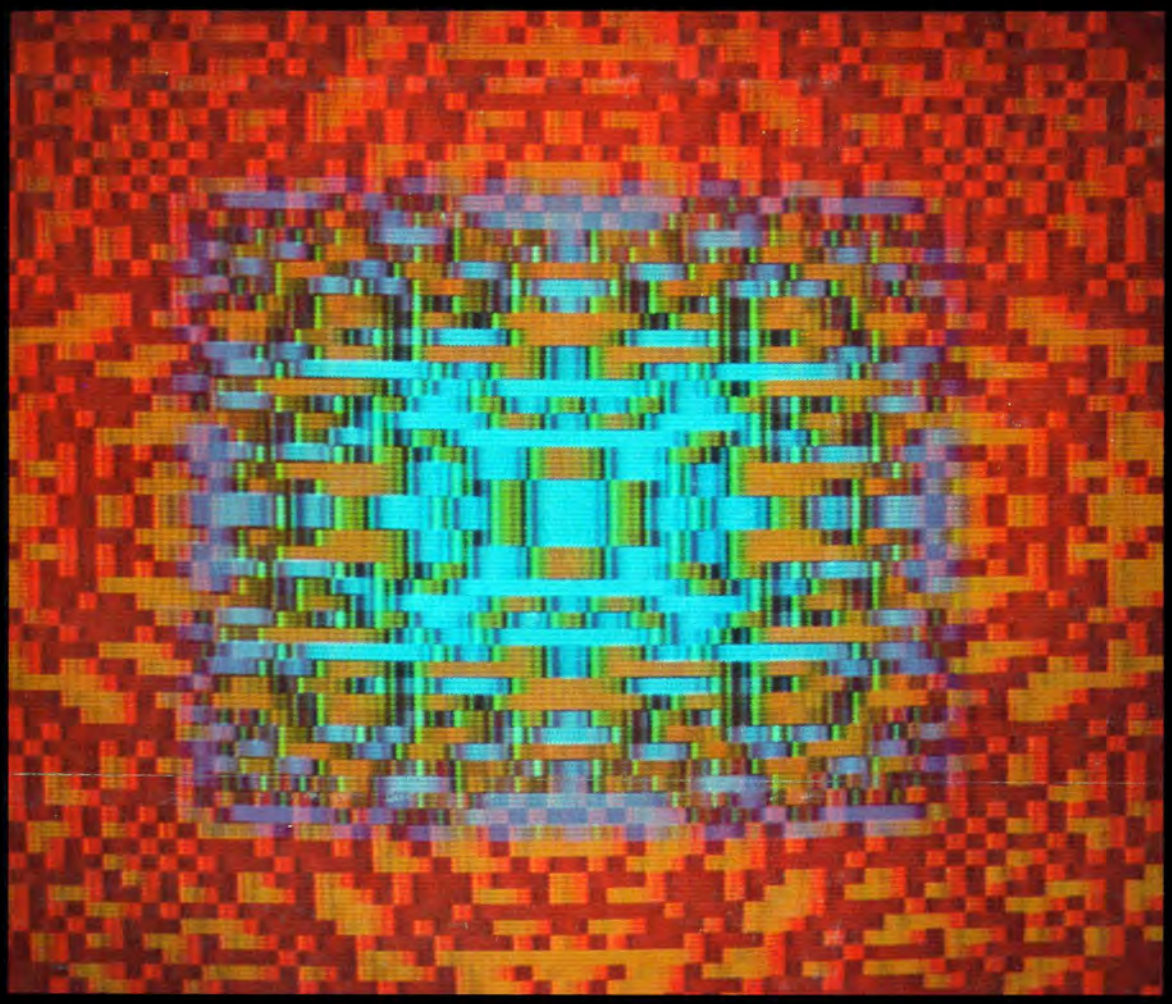
The Official Publication of the Southern California Computer Society
the international computer society

SCCS INTERFACE™

Vol. 1, Issue 11,
February 1977
$1.50 USA



In This Issue:

GODBOUT

BILL GODBOUT ELECTRONICS
OX 2355, OAKLAND AIRPORT, CA 94614

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We're making a case for nice-looking equipment...

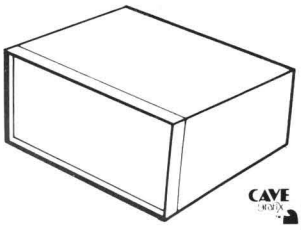
VECTOR-PAK enclosures

There are no screws or fasteners to mar the lines of these beautiful enclosures. Has provisions for card guides, connectors, etc. on the inside. Available in black or computer blue with white front panel; shipped unassembled.

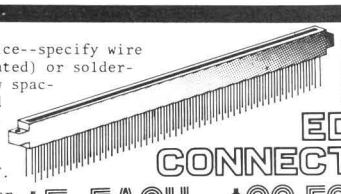
#VP5-17-17U 5.51"H, 17.58"W, 17.1"D **$79.25**

#VP7-17-17U 7.26"H, 17.58"W, 17.1"D **$84.00**

#VP9-17-17U 9.01"H, 17.58"W, 21.6"D or exact same size as IMSAI microcomputer. **$96.50**



Now you have a choice--specify wire wrap pins (illustrated) or solder-tail with .250" row spacing. For IMSAI and Altair peripherals. Wire wrap part # S-100WW. Solder-tail part # S-100ST.



100 PIN EDGE CONNECTOR

#S-100ST is ideal for the IMSAI motherboard. **$5 EACH--$22 FOR 5**

WE STOCK MANY VECTOR PRODUCTS

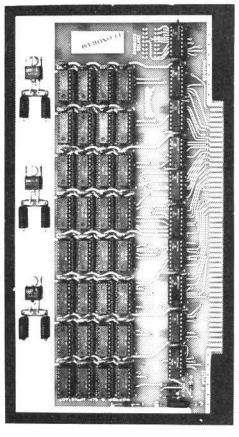
TRIMMER CAPS

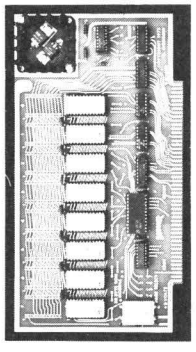
10/$1.95 ASSORTED VALUES. We picked up a batch of brand new, American made, trimmer caps in assorted styles and values. House numbered, so we're not sure of the exact values---and until we get them all tested out, we're selling assortments at a super bargain. Lowest value caps go from 2-8 pF; highest value caps from 50-60 pF. **Ltd qty.**

MULTI-CONDUCTOR WIRE

20	conductor (#28 stranded wire)	20 ft/$5.95
26	conductor (#28 stranded wire)	20 ft/$7.50
28	conductor (#24 stranded wire)	20 ft/$9.95
34	conductor (#28 stranded wire)	20 ft/$9.95

We have a limited quantity of high quality, multiconductor flat cable. Unfortunately we couldn't get as much as we wanted, so if you're interested, get your order in soon. Subject to prior sale.





EconoRom™ $179.95

GIVE YOUR CPU A FRIEND: A HOME FOR PROGRAMS AND ROUTINES.

Our basic ECONOROM board is 4K X 8 worth of eraseable ROM, which you can **program with any program or routine you want** (or have us program it for you). Similar features and same quality as our ECONORAM---and also **very low power: 5V @ ½A, -12V @ 150 ma.** We offer several options:

BASIC ECONOROM BOARD (4K X 8).....$179.95
SMALLER ECONOROM BOARD (2K X 8).....$135.00
BIGGER ECONOROM BOARD (8K X 8; holds 8K BASIC).....$269.95

8080 SOFTWARE BOARD (this is our 4K board, programmed with editor, assembler, and monitor routines for the 8080...a valuable first step if you're trying to get away from machine language programming. **Info package available that describes the function of all $2.95** (refundable with order).....$189.95

EconoRam™ $99.95

OVER TWO YEARS OF EXPERIENCE SELLING 4K X 8 BOARDS HAS SHOWN US **EXACTLY WHAT YOU WANT IN A MEMORY BOARD KIT.**

--**You want low power** to stretch your power supply. Any company can claim low power; not every company offers a spec to back it up. **We guarantee current consumption under 750 ma**, with the average board falling between 600 and 650 ma.

--**You want S-100 buss compatibility**...and Econoram is fully compatible.

--**You want clean and unambiguous data transfer**...which is why we buffered our addresses, data lines, and outputs long before the other guys caught on.

--**You want a fast board.** By using memories guaranteed at 450 ns worst case over the full temp range, we can **guarantee** this board to run at **zero wait states (500 ns or better)**. A 450 ns memory also allows for any propagation delays in support circuitry.

--**You want quality, and we deliver it.** From the epoxy glass, double-sided, plate through board...to the low profile sockets... the optimized thermal design...the DIPswitch address selector... the low power Schottky support ICs...the guarantee we offer on all parts used in Econoram...and more.

--**You want low cost.** Because of our purchasing policies and quantity buying, we can still deliver a board of this quality for under $100. You can pay less, and you can get less. **But if you want the best combination of value and economy...ECONORAM gives you both.**

ALSO AVAILABLE ASSEMBLED, TESTED, AND WARRANTED FOR ONE YEAR FOR $129.95. DISCOUNTS ON ALL KITS AVAILABLE FOR GROUP PURCHASES.

BOOKS

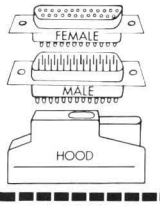
The Adam Osborne & Associates books on microcomputers are recognized as tops in their field. Lucid and complete, these are now available from us ppd in the USA, or buy **all 3 books for $25 ppd.**

"AN INTRODUCTION TO MICROCOMPUTERS, VOL. 1" book #2001. Clearly covers all the basics.....**$7.50**

"VOLUME 2" book #3001. Covers latest uPs and support ICs, replacing 100s of pages of data..**$12.50**

"8080 PROGRAMMING FOR LOGIC DESIGN" book #4001. Demystifies the art of programming.....**$7.50**

LOOKING FOR A GOOD CONNECTION?



25 PIN RS-232 CONNECTORS: sub-mini D type.

Male plug with plastic hood, part #DB25P $3.95

Female jack, part #DB25S $3.95

THERE'S MORE WHERE THIS COMES FROM...

request our flyer

74LS TTL

74LS00	$0.36	74LS139	1.38
74LS01	0.36	74LS155	1.38
74LS02	0.36	74LS157	1.25
74LS04	0.42	74LS160	1.85
74LS08	0.38	74LS161	1.85
74LS10	0.36	74LS162	1.85
74LS11	0.38	74LS163	1.85
74LS14	1.38	74LS168	1.87
74LS20	0.36	74LS169	1.87
74LS21	0.38	74LS174	1.38
74LS22	0.38	74LS175	1.35
74LS27	0.38	74LS221	1.38
74LS30	0.36	74LS240	1.88
74LS32	0.38	74LS257	1.25
74LS37	0.53	74LS258	1.38
74LS38	0.53	74LS273	2.25
74LS42	1.25	74LS283	1.20
74LS74	0.56	74LS367	1.00
74LS75	0.85	74LS368	1.00
74LS109	0.60	74LS377	1.88
74LS124	2.50	74LS378	1.38
74LS125	0.75	81LS95	1.13
74LS126	0.75	81LS96	1.13
74LS132	1.50	81LS97	1.13
74LS138	1.38	81LS98	1.13

Fast Feedback Poll

Stamp
Out
Bugs

SCCS Interface
P.O. Box 5429
Santa Monica,
California 90405

Stamp
Out
Bugs

SCCS Interface
P.O. Box 5429
Santa Monica,
California 90405

Advertising Index

SCCS INTERFACE READER SERVICE CARD

February 1977 Issue. Use before June 1977

(Please type or print)

Name _____ **Title** _____

Company _____ **Telephone (A/C)** _____

Home Address _____

City _____ **State** _____ **Country** _____ **Zip** _____

Signature _____

Please send information on items circled below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
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154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170

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154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170

Fast Feedback on SCCS

Unlike a commercial publication, *SCCS Interface* belongs to its readers – the members of SCCS. You can use the magazine as a forum for your ideas and you can shape it by giving us feedback.

We would like to use the reader service card as a feedback channel. You may respond to the following poll by circling the appropriate numbers on the reader service card and returning it.

We also encourage you to submit questions to be used in these polls and to drop us a note if none of the replies reflects your opinion.

Who Are We?

We speak of SCCS helping people bridge the hardware/software gap. Do you consider yourself to be:

131 Primarily a hardware person.
132 Primarily a software person.
133 Already knowledgeable in both areas.
134 Really a beginner in both areas.

What is your highest educational level?

135 High School or less
136 Bachelors
137 Masters
138 PhD

Are you a professional in the field of computing?

139 Yes
140 No

Are you a professional in the field of electronics?

141 Yes
142 No

Do you use computers in your profession?

143 Yes
144 No

Interface

On page 43, we have listed the hex dump of a program in order to save space. Are you interested in seeing hex dumps?

145 I never relate to anything at that low level.
146 Only print hex dumps if the reader has the option of sending for an assembly language listing.
147 I would use a hex dump that size, but none longer.
148 Fun, not efficiency, is my goal as a hobbyist and I like to enter, decipher and work with hex listings.

The *lowest* level at which I feel programs should be published is:

149 Machine language.
150 Assembly language.
151 BASIC or other higher level language.
152 Language independent descriptions of algorithms.

We are experimenting with xerox reprints this issue (see page 14).

153 I like the idea well enough to try to help turn up good items to distribute.
154 I like the idea, but won't put any personal effort into it.
155 I don't even like the idea.

We had an article on the Altair Bus in the January issue, and are planning another. What sort of equipment do you have?

156 I already have an Altair bus based system.
157 I already have a non-Altair bus based system.
158 I plan to purchase an Altair bus based system.
159 I plan to purchase a non-Altair bus based system.
160 I'm not sure which way to go in my next purchase.

We've received a couple of complaints (a nice one from Carol and a grouchy one from Gene) about the December issue feeling too "commercial", because it featured stores and had a store owner's photo on the cover.

161 I disagree.
162 I didn't react at the time, but they are right.
163 Really, it bothered me also.

Should we bother with product announcements on new microprocessor *chips* such as TI's new I^2L version of the 9900 or National's "number cruncher" with math instructions?

164 Yes, I'd be interested.
165 No, stick to more fully integrated products like kits using those microprocessors.

Last month we decided against publishing an article on a programmable calculator (the HP25), but maybe that was a mistake.

166 I am interested in articles on programmable calculators.
167 I am not interested in articles on programmable calculators.

Gene Murrow has proposed a member discount plan (pg 22).

168 I am not really interested in group discount purchases.
169 I like Gene's plan – do it!
170 I don't like it and am sending my criticism.

Fast Feedback Poll

The Byte Shop reaches a new low in microcomputers. $349

The Byt-8. It doesn't have a nifty (and expensive) front panel with lots of LED's and toggle switches.

And we obviously don't have a big full-color ad.

What we do have is the lowest priced microcomputer you can buy—built around the powerful and popular 8080A microprocessor.

For $349, you get the complete microcomputer card, motherboard, power supply and chassis in kit form.

The Byt-8 S100 bus is the same one used by Altair, IMSAI and most others so you have the greatest possible flexibility in choosing memory and input/output cards.

Optional cards from the Byte Shop include 4k, 8k or 16k of Random Access Memory, 4k or 8k of Programmable Read-Only Memory, a multiple input/output card, a TV typewriter card and, yes, a front panel bootstrap card, if you want the LED's and switches.

Even the CPU is optional. We'll sell you the chassis, motherboard and power supply for $229, and you can choose your own microcomputer card—a ZPU for instance?

Byt-8. It's the new low in price, but we're aiming for a new high in flexibility, delivery and support. See the Byt-8 at your nearest Byte Shop.

BYTE SHOP™
the affordable computer store

Stores now open in: **Arizona,** Tempe; **California,** Berkeley, Campbell, Fresno, Hayward, Mountain View, Palo Alto, Pasadena, Sacramento, San Jose, San Mateo, San Rafael, Santa Barbara, Santa Clara, Santa Cruz, Tarzana, Thousand Oaks, Walnut Creek, Westminster; **Colorado,** Boulder, Englewood; **Minnesota,** Minneapolis/St. Paul; **New York,** Levittown; **Oregon,** Portland; **Pennsylvania,** Bryn Mawr; **South Carolina,** Columbia. If there's no Byte Shop near you yet, please write to Byte Inc., 1450 Koll Circle, Suite 105, San Jose, California 95112 for information on our Byt-8 system.

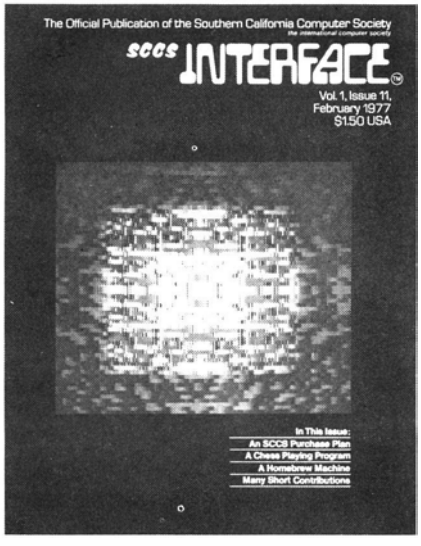
Circle No. 2 on Inquiry Card

SCCS INTERFACE™

THE OFFICIAL PUBLICATION OF THE SOUTHERN CALIFORNIA COMPUTER SOCIETY

the international computer society

VOL. I, ISSUE 11 **FEBRUARY 1977**



Cover Photo by Tom Rugg

Cover Story

This month's cover features a kaleidascope-like display by Steve Grumette and Danny Kleinman's Mandala Program. One page 41 Tom Rugg and Phil Feldman describe the program – its inner workings and the control options open to the user.

FEATURES

DEPARTMENTS:

PUBLISHER'S STATEMENT

Interface magazine is published monthly by the Southern California Computer Society, 1702 Ashland, Santa Monica, California 90405, USA. Subscription rate $1.00 with membership.

All editorial content and effort are contributed at no cost to the Society. Opinions expressed in by-lined articles do not necessarily reflect the opinion of this magazine or the Southern California Computer Society. Mention of products by trade name in editorial material or advertisements contained herein in no way constitutes an endorsement of the product or products by this magazine or by the Southern California Computer Society.

DIRECT ALL EDITORIAL CORRESPONDENCE TO: P.O. Box 5429, Santa Monica, CA 90405.

DIRECT SOCIETY CORRESPONDENCE TO: P.O. Box 49707, Los Angeles, Ca. 90049.

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Los Angeles, California 90048
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Circulation and Distribution
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Hawthorne, California 90251
(213) 676-8693
Between 1 and 8 pm

The Small Computer

Twenty-five years ago a computer as powerful as the new Processor Technology Sol-20 priced out at a cool million.

Now for only $995 in kit form or $1495 fully assembled and tested you can have your own small computer with perhaps even more power. It comes in a package about the size of a typewriter. And there's nothing like it on the market today. Not from IBM, Burroughs, DEC, HP or anybody else!

It fills a new role

If you're an engineer, scientist or businessman, the Sol-20 can help you solve many or all of your design problems, help you quantify research, and handle the books too. For not much more than the price of a good calculator, you can have high level computer power.

Use it in the office, lab, plant or home

Sol-20 is a smart terminal for distributed processing. Sol-20 is a stand alone computer for data collection, handling and analysis. Sol-20 is a text editor. In fact, Sol-20 is the key element of a full fledged computer system including hardware, software and peripheral gear. It's a computer system with a keyboard, extra memory, I/O interfaces, factory backup, service notes, users group.

It's a computer you can take home after hours to play or create sophisticated games, do your personal books and taxes, and a whole host of other tasks.

Those of you who are familiar with small computers will recognize what an advance the Sol-20 is.

Sol-20 offers all these features as standard:

8080 microprocessor — 1024 character video display circuitry — control PROM memory — 1024 words of static low-power RAM — 1024 words of preprogrammed PROM — built-in cassette interface capable of controlling two recorders at 1200 bits per second — both parallel and serial standardized interface connectors — a complete power supply including ultra quiet fan — a beautiful case with solid walnut sides — software which includes a preprogrammed PROM personality module and a data cassette with BASIC-5 language plus two sophisticated computer video games — the ability to work with all S-100 bus products.

Full expansion capability

Tailor the Sol-20 system to your applications with our complete line of peripheral products. These include the video monitor, audio cassette and digital tape systems, dual floppy disc system, expansion memories, and interfaces.

Write for our new 22 page catalog. Get all the details.

Processor Technology, Box K, 6200 Hollis St., Emeryville, CA 94608. (415) 652-8080.

Processor Technology Corporation

Circle No. 3 on Inquiry Card

Calendar

Send announcements of meetings and events to *Calendar,* Karen Wolff, Box 5429, Santa Monica, CA 90405. Be sure to include dates, locations, hours and a phone number to contact for information.

February 28
Minnesota Chapter (SCCS) meeting 7:30 P.M., at Twin City Federal, 3924 West 50th Street, Edina, MN 55424. For information call Jean Rice (612) 941-1051.

February 28-March 3
COMPCON '77. Fourteenth IEEE Computer Society International Conference. Jack Tar Hotel, San Francisco, CA.

March 1-3
NEPCON '77 WEST and the International Microelectronics Conference. Anaheim Convention Center, Anaheim, CA. Registration begins at 8:30 A.M.

March 2
San Fernando Valley Chapter (SCCS) meeting 7:00 P.M. at the Harvard School, 3700 Coldwater Canyon Ave., Studio City. For information call (213) 849-7111.

March 5
VCCS, Ventura County Computer Society (SCCS) meeting 10:00 A.M. at the Camarillo Library, 3100 Ponderosa Dr. For information call Bill Cowley 985-2631 or Fred Moeckel 982-5852.

March 7
AMRAD (Amateur Radio Research & Development Corp.) meeting 8:00 P.M., Patrick Henry Library, Vienna, VA. About 75% of each meeting is devoted to computers. For information call (703) 356-8918.

March 8
Santa Monica Bay Chapter (SCCS) meeting 7:15 P.M., room 125 of Building 114 on Eisenhower Ave. at the Veterans' Administration facility in W.L.A. For information call Ron Carlson (213) 822-8567.

March 9
SCCS Board meeting. For time and place call (213) 472-0388.

March 9
Santa Barbara Computer Association meeting 7:30 P.M. at the Goleta Library, 500 N. Fairview, Goleta, CA. For information call Grant Runyan (805) 962-7734.

March 10
Rochester Area Microcomputer Society (RAMS) meeting 7:30 P.M. at Rochester Institute of Technology, Bldg. 9, rm. 1030. For information call Charles Conrad 889-2971 or Larry Telle 671-1247.

March 15
Entry deadline for the Personal Computing Fair (see Update page).

March 19
SCCS General Meeting at the Los Angeles Hyatt House Hotel. This meeting coincides with the Personal Computer Show and will be held at the hotel at 6225 W. Century Blvd., Los Angeles, CA 90045 rather than at Orville Wright School. There will be discounts on tickets for SCCS members.

March 19-20
Personal Computing Show. International Hyatt House Hotel, 6225 W. Century Blvd., Los Angeles, CA 90045.

March 28
Minnesota Chapter (SCCS) meeting 7:30 P.M., at Twin City Federal, 3924 W. 50th St., Edina, MN 55424. This meeting is co-sponsored with MAEDS (Minnesota Association of Educational Data Systems). Program will be: 1. "Computer Privacy Legislation", 2. "Microprocessors in the Intelligent Terminal". For information call Jean Rice (612) 941-1051.

March 28
South Bay Chapter (SCCS) meeting 7:30 P.M. at the Peninsula Center Library. For information call Warren Weimer at (213) 377-4811, ext. 545.

March 29
Pasadena Chapter (SCCS) meeting 7:00 P.M. at the Pasadena Central Library. They have bit-slice machines vector graphics and exotic languages special interest groups. For information call (213) 681-7047.

March 30
VCCS, Ventura County Computer Society (SCCS) meeting 7:00 P.M. at the Camarillo Library, 3100 Ponderosa Drive. For information call Bill Cowley, 985-2631 or Fred Moeckel 982-5852.

April 4
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April 12
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April 13
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April 13
SCCS Board meeting. For time and place call (213) 472-0388.

April 14
Rochester Area Microcomputer Society (RAMS) meeting 7:30 P.M. at Rochester Institute of Technology, Bldg. 9, Rm. 1030. For information call Charles Conrad 880-2971 or Larry Telle 671-1247.

April 15-17
The First West Coast Computer Faire. San Francisco Civic Auditorium. Two and a half days of talks and exhibitions. For information contact Jim Warren, Faire Chairperson, Star Route Box 111, Woodside, CA 94062 or Bob Reiling, Operations Coordinator, 193 Thompson Square, Mt. View, CA 94043.

April 23
SCCS General Meeting
For information call 377-7703

April 25
South Bay Chapter (SCCS) meeting 7:30 P.M. at the Peninsula Center Library. For information call Warren Weimer at (213) 377-4811, ext. 545.

April 25
Minnesota Computer Society (SCCS) meeting. Place to be announced. For information call Jean Rice (612) 941-1051.

April 25-29
AEDS (Association for Educational Data Systems) Conference 1977, Ft. Worth, TX, with President E. Ronald Carruth officiating. AEDS is a non-profit, private educational organization founded in 1962 by a group of professional educators and technical specialists in education applications. For information, write them at 1201 16th St., S.W. Washington D.C. 20036.

April 26
Pasadena Chapter (SCCS) meeting 7:00 P.M. at the Pasadena Central Library. They have bit-slice machines, vector graphics and exotic languages special interest groups. For information call (213) 681-7047.

April 30-May 1
Trenton Computer Festival '77. 10:00 A.M. Trenton State College, Route 31, Trenton, NJ 08625. For information call Jaci DiPaolo (609) 771-2487.

May 2
AMRAD (Amateur Radio Research & Development Corp.) meeting 8:00 P.M., Patrick Henry Library, Vienna, VA. About 75% of each meeting is devoted to computers. For more information, call (703) 356-8918.

May 7
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May 7-8
Personal Computing Show. Marriott at City Line, Philadelphia.

June 18-19
Personal Computing Show. Haynes Auditorium, Boston.

June 19-25th
World Game '77: An International Workshop on Comprehensive Planning. *Stage I: Planetary Planning Symposium.* A week-long schedule of morning and evening lectures with alternative afternoon seminars on various topics related to global planning. For information write World Game '77, University City Science Center, 3500 Market St., Philadelphia, PA 19104.

June 26 and 27
World Game '77: *Stage II: Design Science Laboratory.* In-depth working experience in comprehensive planning for human needs. The orientation program for this process will be held on June 26th and 27th in Philadelphia and the projects themselves may last as long as six to eight weeks in several locations other than Philadelphia. For information write World Game '77, University Science Center, 3500 Market St., Philadelphia, PA 19104.

For information regarding the new location of the Los Angeles meeting call 377-7703

New Clubs

Chicago Area
Mike Wilson is interested in starting a chapter of SCCS in the Chicago area. Contact him at 10455 Dearlove, Glenview, IL 60025.

Mountain View, CA
A new chapter is forming in the Bay Area. For information contact Ron Raecker, 575 E. Middlefield Rd. Mountain View, CA 94040, (415) 961-7000.

New Haven, CT
Charles Floto, an SCCS member, has formed the Computer Heathkit Users' Group for the exchange of information on use of Heathkit products by computer hobbyists. For information write CHUG, c/o Charles Floto, 267 Willow St., 'S', New Haven, CT 06511.

The Texas Panhandle
The Panhandle Computer Society meets every Friday and is open to all interested persons. For more information contact Tex (naturally) Everett, 2923 S. Spring, Amarillo, TX 79103, (806) 373-8207 or Jerry Fewell, 3109 Browning, Amarillo, TX 79103, (806) 374-0897.

Portland, Oregon
The Portland Computer Society was organized approximately a year ago and now has about 70 members. For meeting times and other information, contact Don Johnson, Box 19013, Portland, OR (503) 246-3131.

Florida
The Space Coast Microcomputer Club is about thirty individuals who are interested in Microprocessor-based computer systems. Many of us are employed at the John F. Kennedy Space Center while others are affiliated with Florida Institute of Technology and Florida Technical University. We utilize a variety of equipment, mostly 8080-based (several Altairs, an IMSAI, a Digital Group, several home-brews) and also a 6800 SWTPC. Many of our members also belong to the larger computer clubs such as SCCS and the Chesapeake Microcomputer Club. Our purpose is to further the usage of small computer systems through the mutual sharing of ideas and resources. You are invited to join us. For the times and places of coming meetings, contact Ray O. Lockwood, 1825 Canal St., Merritt Island, FL 32952, (305) 452-2159.

Rochester, NY
RAMS, The Rochester Area Microcomputer Society has been in existence since April 1976. The major portion of our meetings is a presentation of a microcomputer application or a lecture on a specific microprocessor. We hope to provide the amateur computerist with the following: 1) Access to information through the club library and club members, 2) Group projects to pool resources, 3) Organization of regional computer fests with other clubs. We publish a monthly newsletter called *Memory Pages*. The $5.00 annual dues includes the newsletter. Meetings are held the second Thursday of each month at Rochester Institute of Technology, Bldg. 9, rm. 1030 at 7:30 P.M. For more information write to P.O. Box D, Rochester, NY 14609 or contact Mike Ciaraldi, 22 Burt St., Rochester, NY 14609.

Santa Barbara
The Santa Barbara Computer Association meets on the Second Wednesday of each month at 7:30 P.M. in the Goleta Library, 500 N. Fairview, Goleta, CA. Contact Grant Runyan for further information at (805) 962-7734.

Las Vegas area
R. Curtis West (702) 565-9418 is interested in forming an SCCS chapter in the Las Vegas area.

Society News

Good Old Group Purchase
The board of directors voted to make a second installment payment to people who owed money. This installment will equal 10 percent of the original amount owed.

Resolution to Amend the Bylaws
The SCCS Board of Directors has recommended three amendments to the Bylaws which will be voted on at the general meeting on April 23, 1977. This meeting will also be a special meeting for the purpose of amending the Bylaws.

When the Society was formed, it was assumed that it would remain small and the Bylaws were written with that in mind. The Society has grown to a size at which some articles are not practical. The amendments recommended by the Board of Directors are designed to make Bylaw revision and removal of officers and directors more easily accomplished.

1. Be it resolved that Article V, Section 3 shall be amended to read as follows:
A director may be removed from office by the affirmative vote of two thirds of the regular membership of the Society or by the affirmative vote of two thirds of the Board of Directors.

2. Be it resolved that Article VI, Section 3 shall be amended to read as follows:
An officer may resign or may be removed from office by a majority vote of the regular members or by a majority of the Board of Directors. Vacancies will be filled at the next regular meeting of the Society by nomination and election from the general membership.

3. Be it resolved that Article VIII, Section D shall be amended to read as follows:
Any amendment shall be valid to all intents and purposes, as part of these Bylaws, when ratified by a majority of the votes cast by regular members in an election for amendments, or by two thirds majority of the regular members present at a meeting called for that purpose. Written notice of such meeting shall be given to all regular members no less than fifteen days before the meeting.

Personal Computing Shows
Personal Computing Magazine, organizer of the Personal Computing Shows to be held around the country, have named SCCS a "co-sponsor" of these shows in some of their promotional literature.

We are not sure where the term "co-sponsor" originated or what it means, so we would like to spell out the nature of our involvement with these shows.

We have *no financial interest* in these shows, whatsoever.

We agreed to cooperate by running a full page ad in the January *Interface*. In return for this, *Personal Computing* has given us discount tickets for our members, a room for our March meeting (which will save us over $300) and booths at their shows (unless we have members who are interested in staffing the booths, we probably won't use them).

Finally, we are in sympathy with

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Circle No. 4 on Inquiry Card

Personal Computing's goal of widening public knowledge of and interest in computers via these shows, even though we are not "co-sponsors" of their shows.

Chapter News

Santa Monica Bay Chapter
Here is what happened at the latest Santa Monica Bay Chapter meeting:

The TI9900 was described by a member who had examined the architecture.

A Shugart Mini-Floppy was brought in by Jim Cooper who had bought one for his own use.

A home-brew joy-stick was brought in by Dave Scott of Manhattan Beach, who uses an 8800 in the classroom. We'll have an article on it soon.

Analog interfaces were discussed.

A Poly-88 was shown by Robert D. Nashner, and Lou Fields brought in a TV terminal to help him make an initial test of the video interface. Correct garbage appeared.

Frank Tendrick, home for a visit from M.I.T., said there were only a few people involved in home-brew so far at the Institute.

Two of the new people said they had Digital Group 8080s.

San Fernando Valley Chapter
The San Fernando Valley Chapter of SCCS had a great January meeting. Even on a rainy night, 80 people turned up to hear a talk by Bob Roosth of Texas Instruments. In addition to speaking, he brought with him two TI 9900 Microprocessors which were given away as door prizes at the meeting. This chapter supports itself with door prize/refreshment money and has been running in the black since its start. The February meeting will feature a speaker from A.M.D. and groovy door prizes as usual.

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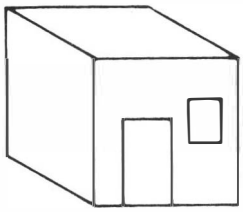
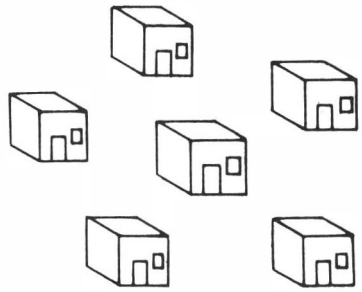
Circle No. 6 on Inquiry Card

WE'VE GOT IT ALL TOGETHER



One Big Store
Us



Lotta Little Stores
THEM

People ask us when we're going to open more stores. That would be a logical result of our success. We've expanded, but all in one location, in Santa Monica. This means we have more people, more demonstration equipment, more inventory, and more spare parts. We've concentrated our resources. For the very best information and service, ask us, we're

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Circle No. 7 on Inquiry Card

Muchas Gracias

The following people have contributed to the legal offensive fund organized by Chip Furness. Their contributions have been applied to legal fees resulting from our law suit with McPheters, Wolfe and Jones. Chip is still open for business at P.O. Box 5429, Santa Monica, CA 90405.

Elmer Acalson
Robert Baily
Leaky Belflower
Lib Brown
Ray DeLong
Michael Dowt
Charles Fete
Thomas Foster
Dean Frankline
Rim Harper
Jim Henderson
Leonard Lanks
Daniel Lingroth
Mike Maiten
Bub Massey
Larry Press
David Resnick
Tom Rockwell
Ward Spaniol
Kendrick Tendick
Jan Van Gordon
Brice Ward
David Welch
Ralph Wilcox
Ken Young
Glenn Mire
Thomas Moses
Bill McRoeder
Robert Nashner
William Paterson

Letters

Gary Coleman Replies

Dear Larry,

I'd like to respond to your January editorial in which my remarks were quoted.

First of all, the remarks in *Byte* magazine (at least as I remember) were made at the Trenton Computerfest. The question of a government bureaucracy (like FCC) needing to be fought was initially brought up by Bob Tripp, *The Computerist* editor. And it was at the Atlantic City PCC that this was brought up, not Trenton.

Second, both Sol and I are definitely in favor of any vector that points to more organization among hobbyists. I think his efforts in bringing the East Coast hobbyists together and my efforts in the Midwest demonstrate this pretty well.

It is regrettable that this misunderstanding on both our parts has occurred. I'm sure you've heard very little about MACC (and I hope to remedy that soon) but we are a quiet group. We have no publication, seeing fit to coordinate the transfer of information between member clubs. Our group purchasing is again handled by the individual clubs with a coordination effort from MACC. MACC is supported entirely by our convention which is held once a year in June. We held the second Computerfest in the world (Trenton was first), and have no dues. We have been around for over a year now and have suffered many of the growing pains SCCS has. I believe that the problems may have appeared to be bigger in SCCS's case because of the publicity as well as (paradoxically) lack of information. There was a general feeling of sadness at PCC '76 that SCCS's "great experiment" was going down the tubes. I'm glad to see that this is not the case.

Let's try and communicate a little more. I'm sure we can all do each other a lot of good!

In conclusion, let me say that I think a national organization is inevitable. The efforts of Sol Libes, Rick Kuzmack (Chesapeake Microcomputer Society) and myself are regional experiments. We are trying to find the people who can help to lead this national group. Eventually, it will be to our benefit to merge our groups, if only to eliminate duplication. But the regional groups will never go away. The MACC philosophy is for "distributed responsibility". I don't think that it is opposed to that of SCCS. We were all started to make it easier to have fun. Let's have fun!!

Yours truly,
Gary Coleman
President, MACC

P.S. I'm serious about more communication. Let's you and I keep up a lively correspondence. We can both help each other and I'm sure that neither one of us wants to be proven wrong next January!

Gary,

Really, let us hear more about MACC—the pages of Interface *are open to you to use as you will. Like we keep saying,* Interface *is your magazine, not "ours". We also fully endorse the philosophy of distributed responsibility, but sometimes its hard to find "distributees".*
Larry

Sol Libes Replies

Dear Larry:

Thanks for the prompt response to my recent letter. Maybe it means that SCCS can still turn around. I say this from the fact that previous letters of mine either were ignored or took months before there was a response.

I would like to respond to points raised in your January editorial and Lou Fields December editorial.

1) Carl Helmers misquoted me in saying that I did not see a need for a national computer hobbyist organization. I wrote him a letter pointing this out to him which he promised to publish (this was several months ago).

2) We are interested in affiliation with a national organization. However, the reasons for doing this do not appear to be the same as those pointed out by Lou Fields in his editorial. The primary factor that discourages us is the high cost of the affiliation. I do not agree when Lou says "mailing charges would quickly exceed any reasonable club dues". During 1976, our dues was $2 for which each member received 12 ten page newsletters mailed 1st class and a membership directory (and advertising space occupied less than 10% of the NLs). Incidentally, our 1975 dues was $1.00! Our 1977 dues was increased to $4. We maintain two software libraries and do group purchasing with no surcharges tacked on. Members of other amateur computer clubs can participate in any of our group purchases without becoming a member of our club or being charged for the service, provided their club reciprocates.

We send copies of our newsletter to other computer clubs at no charge, on an exchange basis (for example we have placed you on our mailing list at no charge even though I had to pay $10 to get on your mailing list).

3) We are a group of amateurs helping one another. Our machines are extensions of ourselves and the foundation of our comaraderie. For this reason we have avoided money-making schemes such as a glossy magazine, large scale purchases, etc., all of which are really profit ventures.

Sol Libes, President
Amateur Computer Group
of New Jersey

Sol,

I'll only make one comment—if you think that Group Purchase and Interface *have been profitable, you're wrong. They have cost dearly in terms of money and volunteer time.*
Larry

Lost Editorial Correspondence

Dear Lou (Fields),

Many months ago I sent a letter to Larry Press offering to coordinate medical applications for *Interface's* "Applications Exchange". I don't know whether the letter was received or whether he thought someone living in Southern California should be coordinating medical applications. But no matter. I would again like to offer whatever help you need in medical application exchange.

Incidentally, I was extremely happy to see *SCCS Interface* back in the mails, I judge a magazine of this nature by how many letters I write to people in it, how

many items I order from it, etc. Five from this issue alone. Keep it up!
Sincerely,
Dick Moberg
Dept. of Neurological Surgery
Jefferson Medical College
Philadelphia, 19107

P.S. Enclosed is a copy of the letter to Larry.

Dick,

Lou gave me this letter as well as your old one to me. I never responded to your request to coordinate medical applications because you inadvertently addressed it to Box 1234, Cerritos, CA 90701. Since August 1976, I have not received any mail directed to that address.

Sorry for the hassle, and I'll list you as coordinator starting this month. By the way, I judge a magazine the same way you do.
Larry

Too Much Computer Store Hype
Dear Larry,

Interface number 9 was not that great. I understand the limitations, etc. under which you labored so I'll make no more of it. I'm really concerned about the profusion of computer stores and franchisers. A lot of enthusiasts are going to lose a lot of money in a market that is already near its capacity. Maybe things will be better in the future when the blisterpack computer becomes available. But, today, the market is limited.
Barry Gerber

Barry,

We understand and share your concern. We merely let the franchisers tell their stories, but would be most anxious *to publish statements of difficulties experienced by stores.*
Larry

A Nice Letter
Dear Larry,

Congratulations on your new assignment as editor. I received my *SCCS Interface* just in time for Christmas. What a great gift.

I am going to attempt to write a few articles for *our* magazine when I get time between classes.

In the six month period of buying, assembling and "bringing up" my IMSAI system, I have learned more than I had ever thought possible. This has been and continues to be a rewarding and learning experience beyond any I have yet known.
Sincerely yours,
Dikran Markarian
16677 Markham
Fountain Valley, CA 92708

Dikran,

Each paragraph of your letter gets us high.
Larry

How to Organize SCCS
Dear Larry,

Regarding the problem (raised by Stan Veit in a letter in December) of non-Californians, their "member or subscriber" status and their non-participation in meetings and other activities, the best solution seems to be to split the SCCS into two groups: a genuinely Southern California club and a world-wide federation with annual or semi-annual meetings of delegates from clubs everywhere. The federation would publish *Interface,* as ARRL puts out *73,* and its meetings would be big convention and trade shows, while a small, paid permanent staff co-ordinated a telephone or radio program exchange network. All in all, the federation would resemble ARRL but without the political work that is so necessary to the Amateur's survival. I enclose a check for the legal offense fund.
Yours faithfully,
James E. Henderson
338 West 47th St.
New York, NY 10036

Tutorial Feedback
Tricia Wood,

Regarding your planned series of articles, I feel it's a great idea. Once this series gets started, I'd like to mention it (or perhaps reprint part of it) in *Compute,* National Semiconductor's microprocessor user group newsletter.
Sincerely,
Georgia Marszalek
Editor, *Compute*
National Semiconductor Corp.

Feedback from a Store
Dear Mr. [Phil] C. De Baca,

Welcome back! We would like to carry the *SCCS Interface* in our store. Please enter (again) a standing order of 100 per month, starting *fast* with the one we just received at home.

We wish you much success, and look forward to as excellent a publication as your previous one.
Sincerely,
Dede Veit
Computer Mart of New York, Inc. 314 Fifth Ave.
New York, NY 10001

SCCS As Agent for Authors?
Dear Larry,

It's good to be getting *Interface* again. Since the publication is currently unable to pay for articles, may I offer a thought on how to maintain the excellent quality? After an article has been published in *Interface,* SCCS can broker publication rights to other publishers, splitting royalties between the author and the society's operating fund. I'm certain that many reluctant members would submit articles if such an arrangement were made. The benefits include wider dissemination of technical information and society exposure, as well as benefitting the author and magazine. Since our ranks are large but not (yet) overwhelming, a great deal of the readership of other publications would find our material new and stimulating. What do you think?
Orin Laney
5900 Dale Street
Buena Park, CA 90621

We got Orin's letter and another complaining of mistreatment from a publisher on the same day. Perhaps hobby computing authors should deal through agents, and perhaps SCCS could represent them. Let's have discussion of this suggestion and authors should let us know what they think.
Larry

Just Call Him Alan
Dear Larry,

The review of Molly Gleisa's article (on page 53 of the December issue) must have the subject of this article Turning in his grave...!

Seriously, the format, typography and content of this issue are great—congratulations!
Sincerely,
Art Silliman
Urbana, IL 61801

Short Contributions: Fact, Opinion, Announcements.

REPRINTS: An Offer and a Request

We are going to experiment with offering reprints from club newsletters and other un-copywritten sources. To cover xerox costs, we will charge a nickel (5¢) per page, payable in cash, 13¢ stamps, postcards, gold watches or any other readily negotiable commodity.

To keep things low-key, we will insist that every order be accompanied by a self addressed stamped envelope. Otherwise, it will be thrown away and we will just keep the nickels.

If you think that this is a good idea, we need your help. You should send us copies of things which you come across that seem worth reprinting (data, programs, articles, or anything else which can be xeroxed). Make sure that we have permission to reprint it and type up a short review.

We'll kick it off this month, but we don't have the energy to do this by ourselves. It will only work if SCCS members make the effort to submit good material for reprinting. *Interface* is your magazine, use it.

Reprint on *Cassette Libraries* (5¢)

The January 19th issue of the Homebrew Computer Club Newsletter *contains an article by club librarian Gordon French on their system for distributing programs on cassette. The article, which contains practical suggestions and some nice philosophizing, should be of interest to club program librarians or anyone interested in cassette interchange.*

Want a copy of Gordon's article? If so, send a nickel (5¢) or a stamp or something worth a nickel and a self addressed stamped envelope.

Reprint on *Roger Modeen's Cassette Interface (20¢)*

In the December issue, we featured an article on Roger's homebrew cassette interface. Hap King of Bellevue, Washington, has constructed one which is working well. He has also written 4 pages of notes on the interface, giving a number of recommendations and trouble-shooting tips. This would be for anyone building Roger's cassette or studying the circuit.

Reprint on *Steve Grumette and Danny Kleinman's Mandala Program (30¢)*

On page 41 of this issue, Phil Feldman and Tom Rugg have described the operation and general structure of the mandala program featured on the cover. We felt that the commented assembly listing was too long to print, but if you would like a copy of the assembly language listing and supplemental documentation, just send us 30¢ and a SASE.

HD Transformer Update

I have some good news about our Altair HD transformer. We have been able to incorporate a significant improvement into its design, namely the addition of a third primary tap.

This will be especially useful to those of you who have small systems drawing less than 3 amperes on the 8 volt line. Several users complained that the old design supplied a somewhat high voltage in this range, causing undesirable heat dissipation, and this problem will now be overcome.

An inevitable consequence of this improvement is that the price has to go up by $2.50 per transformer, so the price *(to SCCS members only)* is now $27.50.

Rudy Hirschmann
1001 Kagawa St.
Pacific Palisades, CA 90272

Rudy is referring to the transformer mentioned on page 15 of the January issue of Interface.

Getting High with a Sol-20

by Barry Gerber

I just finished putting together a Sol 20 and to be quite truthful, it was one of the most elating experiences of my life. On each of the several tests it worked perfectly. An amazing experience. As I went along, I kept a record of any problems encountered—mostly with documentation, and the following is a short contribution on those problems and my resolution of them. It is the kind of information I wish I had during assembly and when testing the monitor.

For the first time in my life, I have just completed a kit that worked perfectly the first time. Considering that I built a complete smart terminal, this success is overwhelming. The Sol 20 Terminal/Computer is a most carefully thought out and beautifully designed unit from the main printed circuit board to the power supply to the expansion chassis (5 slot motherboard) to the keyboard to the very slickly designed exterior finishing (walnut sides no less). However, any new product is bound to have a few bugs, even if only in its documentation. In order to allay any concerns in the mind of the kit builder, I offer here a few comments on documentation errors or ommissions in the Processor Technology Sol Systems Manual.

1. Page III-17 R 127 and R 129 should be Brown-Black-Orange not Orange-Black-Orange.

2. When the clever little test probe is used to measure voltages during two of the many reassuring checks, be sure not to contact any non-grounded surface with the grounded lead of the probe. Attaching a ground clip to the edge of the board almost insures such contact. Find a fully isolated ground point. There are several on the main PCB.

3. Page 12 section IV though a bit of careful reading makes it clear, you are measuring –12 volts in Step 41 part 3.

4. Processor Tech is sending a keyboard PCB modification revision with kits having the already modified PCB. Revision B of the keyboard PCB already has the modifications.

5. Some comments on the software. The Sol has 1K of character display RAM and 1K of what is called "system RAM." Though certain advertisements and comments have implied that the 1K of system RAM is available for programming, this is not entirely so. As much as the first 256 bytes of the system RAM is utilized by the video display and a good portion of the upper section of system RAM is used as a stack for the PROM resident Sol monitor. So don't be surprised if you can't enter data into these areas or if strange things happen in the video display if you can enter data here. The software section of the Sol manual implies that all 1K of system RAM is initialized (to zero) on start up or re-start. This is not so, the listing of the monitor shows that only the first 256 bytes are so initialized. This is, of course, another reason for not using that first 256 bytes. It will be cleared on any restart. Once one understands and accepts these limitations of the monitor and the system RAM, the CONSOL monitor becomes a joy to use for one who is used to the old digital inputters (fingers on toggle switches) of the basic Altair and IMSAI systems.

Thorough Software Tutorials Wanted

I thoroughly enjoy your magazine and feel that you are on the right track. However, since you've expressed the desire to hear the needs of your readers, I thought I'd express a few of mine. I understand that your magazine deals mostly with home computerists and in this respect many of your readers may be only interested in what they can put into the little box they've acquired, to get a specific thing out.

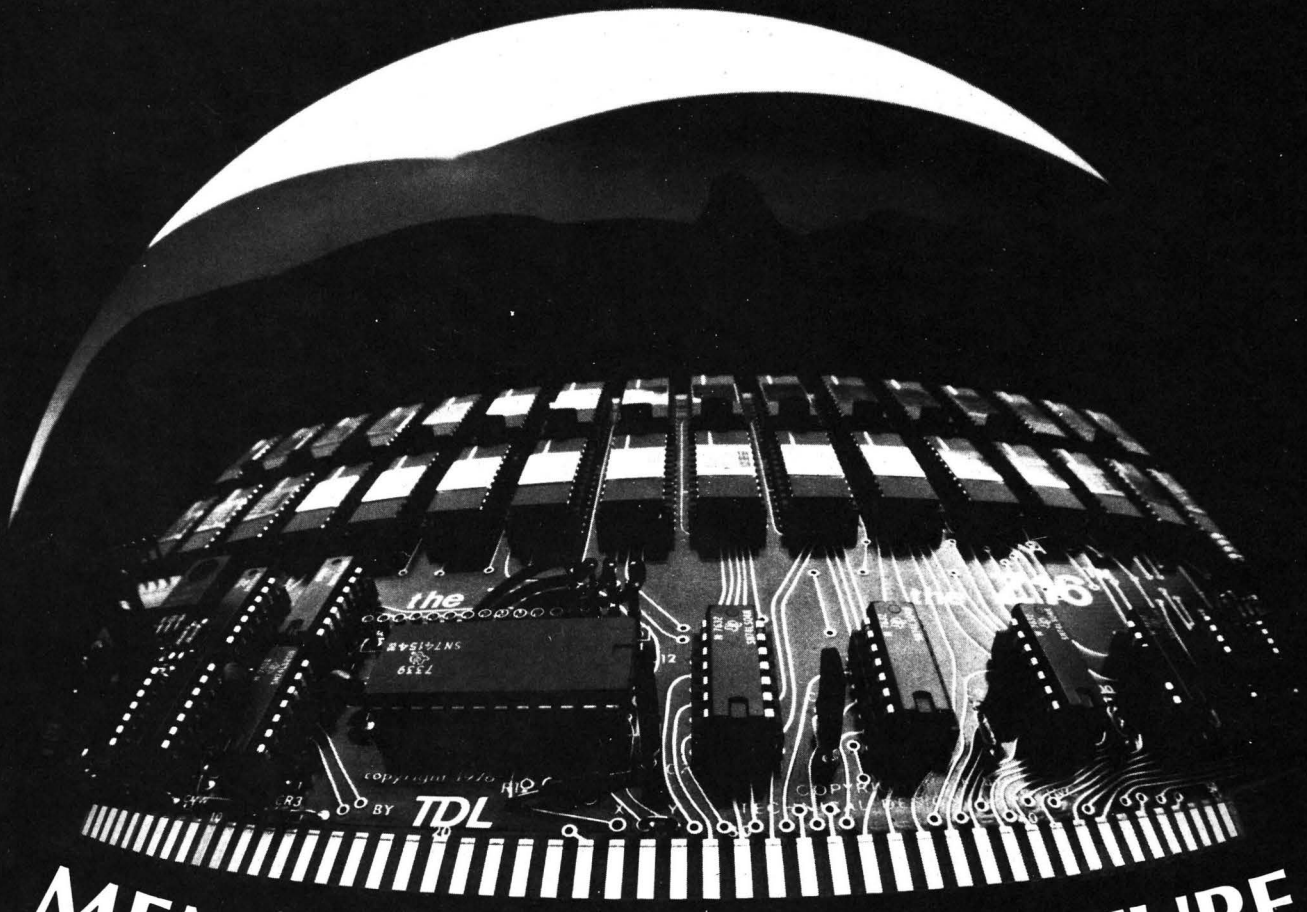
However, it appears as though you may have a few readers interested in what goes on inside that little box. Apparently this is the reason for Tricia Wood's tutorial series. I would like to see you go a step further and have articles for those of us who are just short of being totally ignorant. For example, it would be nice to have an article that a layman like myself can understand on what an assembler is and how to make your own. I find that many articles are so drastically over simplified that in most cases I feel that I am totally wasting my time. Admittedly, those that understand the process would get bored with the detail in such an article; however, lack of thoroughness has become a sore spot with me.

I would like to see the writers be a little kinder with the vocabulary also. My dictionary defines *baud* as "a unit of signaling speed derived from the duration of the shortest code element", which is not very informative to the novice. One famous book says "they all spoke in different tongues, but understood each other". Unfortunately I seem to find difficulty in my own tongue.

I hope also that you will include articles on these microcomputer boards that so many microprocessor houses are building. For example, how do people deal with unique connectors, no power supplies and input/output? How do people get small quantity parts when many companies refuse to even talk with you unless you sign an order for a thousand parts? What do the proms do in preassembled computers? I could go on and on. I am looking to magazines such as yours to answer my questions without the pomp that books like to present.

Sincerely,
Arthur Goeres

Editor's comment: We need either original tutorial articles or references to good articles and books (sorry Arthur, but there is no such thing as a single article on how to build an assembler).



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Utilizes the EMM SEMI 4200 memory chip which is organized as 4K by 1 bits. Provides maximum access time of only 200ns. Added to board logic time, total board access time is below 250ns. No other memory board made to S100 bus specs can match this.

Each 4K block may be individually addressed at any 4K page border. You have the versatility of most 4K boards in your 16K package. Address changes are very easily accomplished by using a simple jumper scheme. Each 4K block may be individually protected by a switch.

Power consumption is outstandingly low! Only 205ma from the +8v, 105ma from the +16v, and 24ma from the −16v, for a FULL 16K. Battery backup with a simple jack connector.

Fully solder masked and silk screened board, sockets for all IC's. Complete documentation includes source code for comprehensive memory test program and paper tape of this program.

KIT: 4K - $169; 8K - $295; 12K - $435; 16K - $574; 4K expansion kits - $140.

16K assembled and tested: $644.

Delivery: Off the shelf to 30 days.

*OFF THE SHELF

Expand your memory. Hurry, use coupon below to order. Or call (609) 921-0321

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☐ 16K - $574 ☐ 4K Expansion Kit - $140 ☐ Assembled & Tested - $644

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City _____ State _____ Zip _____

I enclose ☐ Check ☐ Money Order - amount of $ _____

Charge Card Data: ☐ BankAmericard or ☐ Master Charge. # _____

Exp. Date _____ Signature _____

☐ Send COD. I enclose 25% deposit. ☐ Send your FREE CATALOG.

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Insurance Info Needed

My home insurance recently came due for renewal and I tried to have my computer included. The insurance agent did not know how to handle it. He said that a computer would be considered business property, not household property. He was able to insure jewelry, camera equipment, guns, high-fi, furs, coin collections, and many other hobby gadgets but not computers.

Surely out there in SCCS land there are some insurance types who could write up some specialized computer theft insurance...perhaps SCCS itself could start such an enterprise? There is definitely a need.

Art Armstrong

If anyone can shed light on this problem, please get in touch.
Larry

December Bug

There is a bug in George Hockney's name extraction program in the December issue. Mr. Hockney tells us to examine his last-name program on page 49 closely, and such analysis shows that the program will extract the last K + 3 characters of the last name where K is the number of letters in a title ending with a period. Thus if the user were to identify himself as "PRES.GEORGEWASHINGTON" the computer would reply "HELLO, PRES. HINGTON". This is unacceptable. To make it work right, line 30 on page 49 or line 75 in the final program must read:

```
75 T$=RIGHT(T$, LEN(T$)-INSTR(T$," ")).
```

Please keep up the good work.
Jim Henderson

Thanks Fellas

We just heard that Don Tarbell and John French each gave SCCS some hardware. Don gave us a Tarbell Cassette (what else?) and John a Teletype. Both are past members of the Board of Directors.

IM 6100 Price Cut

Intersil, Inc., has reduced prices on all grades of its 12-bit C/MOS microprocessor (the IM 6100) up to 65 per cent, effective January 15. The IM 6100 emulates the instruction set of the PDP-8/E.

Ken Young Says

You wouldn't buy hardware without a schematic, don't buy software without good documentation.

Robots

The United States Robotics Society is a non profit organization which serves its members by gathering, collating and publishing robotics materials from all available sources. The goal of the Society and its membership is to serve the human purpose of preparing for the inevitable development and distribution of thinking machines. Glenn Norris, USRS president is also SCCS coordinator for robotics (see the Applications Exchange). Membership is $10.00 per year. For more information contact the USRS at Box 26484, Albuquerque, NM 87102.

Books at a Discount, A Righteous Comment

Have you noticed that everyone and his brother is selling mail order books these days? It turns out that there is a hefty markup in books (geared toward retail stores) so mail order looks good. In addition, many publishers will drop ship books, so a mail order operation doesn't even need to carry an inventory. One of the first things we noticed about the United States Robotics Society (above) is that they sell books to their members for significantly less than the retail price. That's nice.

TCF rides again

The *Trenton Computer Festival* (TCF), the originator of amateur computer fests, will happen again, on April 31-May 1, 1977.

The second annual TCF will be bigger and better than the original. It is being expanded to two full days, with new and larger facilities to house up to 90 exhibitors. There will be 30 speakers and demonstrations galore. There will be hundreds of door prizes and a huge outdoor flea market.

Computer conference sections and forums are planned on the following topics: Microcomputers for home, radio amateurs, education and medicine; consumer applications of microprocessors; computer music; robots; graphics; speech synthesis; establishing amateur computer standards; computer club convention.

It is expected that attendance will exceed 3,000. There will be amateur computing contests and awards, Saturday night awards banquet, programming copying service, forum audio cassette copying service, free bus service between hotels/motels and fest, activities for wives and kids, and free parking for up to 4,000 cars.

TCF-77 is being sponsored by: Amateur Computer Group of New Jersey, Philadelphia Area Computer Society, Trenton State College Digital Computer Society, Institute of Electrical & Electronic Engineers-Princeton Section and the Department of Engineering Technology, Trenton State College.

Calculators/Computers A New Magazine for Educators

The concept of CALCULATORS/COMPUTERS Magazine was developed to fill a distinct void in the availability of practical computing material written for educational purposes. Over the past few years more and more hand held calculators have appeared in the classroom as well as in the home. The rapid growth of microcomputer use provides a new avenue of innovation for educators as well as home users. Many schools are exploring their use through experimental programs. There is no doubt that it is essential that every student

and parent become accquainted with the nature of computers and roles which they play in our society.

The most serious restriction on educational computing today is the lack, in quantity, of proven instructional materials. Computer software development is expensive. Until the market for such materials becomes sufficiently large, this area will be avoided by the mass market oriented textbook publishers. The development of computer software will be left to the hobbyist and non-profit insitutions such as the schools themselves. Increased computer usage will lead to a corresponding increase in the publication of materials. It is the goal of CALCULATORS/COMPUTERS Magazine to search out material from equipment manufacturers, hobbyists, teachers, parents, students, and other potential sources. We will then edit the material and present it in a form suitable for use in the home or in the classroom. Individualized instruction, with each student working at his own pace and reaching his own level of achievement, has been a goal of education for some time. The computer, using Computer Assisted Instruction (CAI), is an ideal tool for use in attaining this goal. CAI materials will be a part of our content.

Calculators and computers can support all educational philosophies from conservative to progressive. Basic skills can be reinforced through drill and practice. Special environments and social situations can be created through educational games and simulations. Practical applications of problem-solving skills can be experienced. All of these, and more, facits of the world of calculators and computers will be explored in CALCULATORS / COMPUTERS Magazine.

Don Inman, Editor.
CALCULATORS/COMPUTERS
Box 310
Menlo Park, CA 94025

This magazine is being published by DYMAX, the profit-making side of Peoples Computer Company. They and Don Inman have much experience in the area.

Lou Fields Chairs a *Compcon* Session

The Personal Computers session at IEEE COMPCON/77 will be chaired by SCCS President Lou Fields. Lou has lined up the following speakers and topics:

"THE FUTURE OF PERSONAL COMPUTING," Bob Davis, Intel

"APPLICATIONS OF A STAND ALONE PERSONAL COMPUTER," Douglas S. Hancey, Sphere Corporation

"THE COMPUTER HOBBYIST WILL BE LEFT BEHIND," Don Tarbell, Tarbell Electronics

"THE PERSONAL COMPUTER AS A CONSUMER PRODUCT," John Vurich, National Semiconductor

Personal Computing at the NCC

The 1977 National Computer Conference in Dallas will be the year's largest gathering of data processing users, computer professionals and computer hobbyists.

Specially featured will be the first NCC Personal Computing Fair & Exposition, comprising a Personal Computing Fair, papers and panels, club congress, headquarters hotel and product exhibits by leading manufacturers.

Personal Computing Fair entries must be non-commercial personal or group-owned small computing systems. They may feature hardware and/or software implementations, games, recreation, music, art, amateur radio, scientific, miscellaneous and general applications. Prizes and awards will be given in all categories.

Working systems are desired, although projects that might not lend themselves to display at the fair might be illustrated audio/visually if the judges believe the project is acceptable otherwise. NCC will provide at no charge the booth space, a sign, coordinated furnishings, power and lighting. Accepted entrants will earn free full conference registration (except for the Proceedings).

For information, write or call Ric Martin, Personal Computing Fair chairman, c/o The Micro Store, 634 S. Central Xwy., Richardson, Tx. 75080, 214/231-1906. To enter, send him a concise, one-page, double-spaced description of your system with your name and home and business addresses and telephone numbers. The entry deadline is March 15 and Acceptance will be announced by April 15.

Hey, Computer Stores!

We sent the following letter to all of the computer stores that responded to our last survey. We would also like to invite all the other computer stores to contribute ideas for the next survey and descriptions of their unique services.

Dear Computer Store,

Thank you for participating in our computer store survey. We enclose a copy of our summary of the responses.

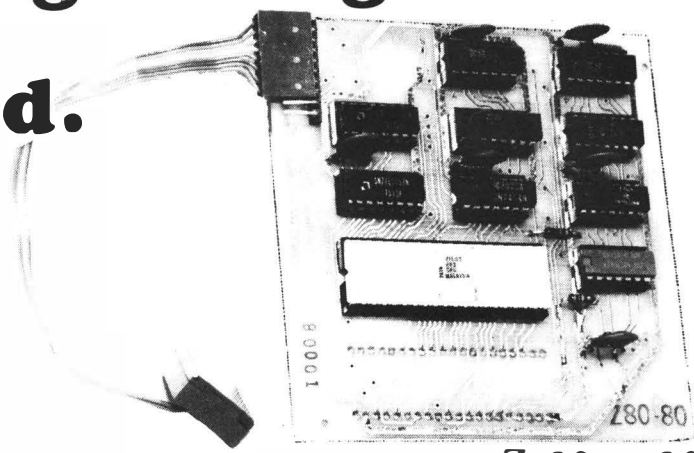
We're planning a second questionnaire and would like your input. What kinds of information would be of interest to you and to our members (your customers)?

In addition to surveys, we would like to publish concise descriptions of unique *services which are available at specific stores such as yours. The goal would be to give ideas to other stores and to raise the expectations of your customers a bit. The stores which contribute will, of course, get recognition for their innovations.*

If you are offering a unique service, type up a paragraph or whatever it takes to describe it and send it to us.

NOW!!

Z-80 Power for the S-100 bus without getting rid of your CPU card.



$159.95

assembled

DUTRONICS® *a leader in low cost, low power ram boards has just announced it's* *Z 80 – 80* *piggy back card. This plug – in board enables you to use your existing IMSAL, ALTAIR CPU card and upgrade your system to a Z – 80.*

The card design is such that all you do is pull out your 8080 and 8212 chips, plug in the Board to the 8080 socket itself and the ribbon cable to the 8212.

A system monitor, on paper tape, is included with the board as well as a 280 Manual and Theory of Operation Manual.

Dutronics will also supply all additional software at no cost, when it becomes available
The price is $159.95 (assembled) only. OFF THE SHELF.

BYTE OF PHILADELPHIA
1345 W. Lancaster Ave.
Bryn Mawr, Penn. 19010
(215) 525–7712

BYTE OF PALO ALTO
2227 El Camino
Palo Alto, Ca. 94306
(415) 327–8080

BYTE OF SAN MATEO
1200 W. Hillsdale Blvd.
San Mateo, Ca. 94403
(415) 341–4200

BYTE OF WESTMINSTER
14300 Beach Blvd.
Westminster, Ca. 92683
(714) 894–9131

BYTE OF SANTA CLARA
3400 El Camino Real
Santa Clara, Ca. 95051
(408) 249–4221

for more information call or write to:

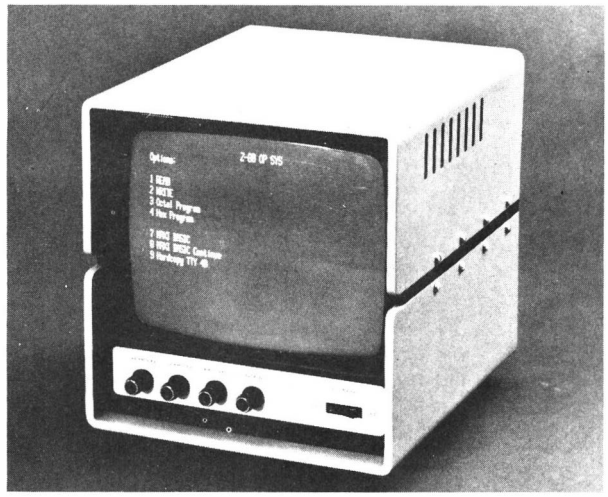
R.H.S. MARKETING

2233 El Camino Real
Palo Alto, California 94306
(415) 321–6639

DEALER INQUIRES INVITED

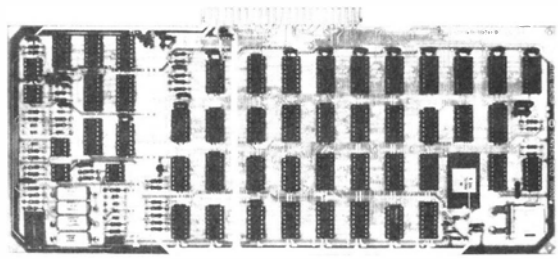
B of A & MASTERCHARGE ACCEPTED

The Digital Group adds character(s).



64, to be exact.

The Digital Group's computer systems have a lot of character already. Just one quick look at any of our products in their unique custom cabinets confirms that. But we believe it never hurts to add a bit more.



So, the Digital Group has added character in a big way to give an added dimension to the operation of our video-based computer systems. We are pleased to announce our new TV readout with a 64-character line. It will give your system a great deal more capability. Give it more character, if you will.

Here are the specifics on the Digital Group TV Readout and Audio Cassette Interface:

1024 Character TV Readout

- 64 characters horizontal by 16 lines
- 7x9 character matrix (effectively 7x12 due to character shifting)
- 1K on-board RAM for buffer storage—requires no main memory—completely independent
- 128 character ASCII
  - Upper case alpha
  - Lower case alpha with base line extenders (g, j, p, y)
  - Numbers and extended math symbols
  - Greek alphabet
- Software driven cursor—forward and backward
- Compatible with most microprocessors; Interfaces with 1 8-bit parallel output port
- Timebase may be driven with an external timebase (may be synchronized to TV camera, TV set, etc.)
- Readout timebase available at connector (can be used for graphic driver, etc.)
- White characters on black, and/or black on white; software selectable
- Plugs into standard dual 22-pin TVC connector on Digital Group Systems

Improved Audio Cassette Interface:

- Reliable FSK recording technique
- Uses standard unmodified audio cassette recorder
- Write cassette system uses a digitally synthesized frequency shift system, derived from TV system's master crystal oscillator
- Read cassette system easily aligned using the write system as an alignment aid.
- Runs at 1100 baud (100 characters/second)—loads 16K in 3 minutes

512 TVC to 1024 TVC Upgrade Kit:

As always, when the Digital Group extends the capabilities of our systems, it doesn't mean obsolescence for any products. We are offering an upgrade kit for present Digital Group system owners who wish to go to the longer line length. This kit uses most of the IC's from our TVC-F readout. No unsoldering is required; all new sockets, capacitors, resistors, PC board and other necessary parts are supplied.

Prices:

TVC-64—Full 64-character TV Readout & Audio Cassette Interface:

Kit — $140 Assembled — $205

TVC-64UPG—Upgrade kit from TVC-F:

Kit — $65

If you already own a Digital Group system, our 64-character line will definitely enhance its operation. If you're just looking, you might want to keep in mind that the Digital Group has a lot of characters.

Write or call now for details on our new 64-character TV readout and all our other exciting products.

the digital group INC

box 6528 denver, colorado 80206 (303) 777-7133

Circle No. 11 on Inquiry Card

Applications Exchange

By Larry Press

Wouldn't you like to be a happy-go-lucky coordinator?

COORDINATORS

Secondary Schools:
Art Armstrong,
3345 Moore St.,
Los Angeles, CA 90066
(213) 397-3874

Commodity and stock price prediction:
Mary Stevens,
11745 Montana Ave., #110,
Los Angeles, CA 90049
(213) 472-1098

Programs for small children:
Joanne Verplank,
1919 Menalto Ave.,
Menlo Park, CA 94025

Biorythms:
Art Childs,
335 N. Adams, #210,
Glendale, CA 91206
(213) 243-5179

Statistical applications:
Barry Gerber,
Dept. of Political Science,
CSU Fullerton,
Fullerton, CA 92634
(714) 993-1567

Computer graphics:
John de Longpre,
11464 Bailey Dr.,
Lowell, MI 49331
(616) 897-5822

Power supplies:
Fred Schultz,
3734 W. Slauson,
Los Angeles, CA 90043
(213) 299-4439

Amateur Radio Applications
AMRAD,
1524 Springvale Ave.,
McLean, NJ 22101

Translation and Teaching of Natural Languages:
Bob Keene,
Box 234,
Simi Valley, CA 93065

Medical applications:
Lou Fields,
11662 Sunset Blvd.,
Los Angeles, CA 90049
(213) 272-0942

Dick Moberg,
Department of Neurosurgery,
Jefferson Medical College,
Philadelphia, PA 19107

Biofeedback:
Larry Press,
1702 Ashland,
Santa Monica, CA 90405
(213) 396-0048

Electronic music:
Prentiss Knowlton,
255 N. Madison Ave.,
Pasadena, CA 91101
(213) 449-6034
Suite #4.

Robotics:
Glenn Norris,
USRS,
Box 26484,
Albuquerque, NM 87102

Voice synthesis:
D. Lloyd Rice,
821 Pacific, #4,
Santa Monica, CA 90405
(213) 392-5230

Games:
George Tate,
3544 Dahlia Ave.,
Los Angeles, CA 90026
(213) 663-2604

Astrology and ESP:
Al Manning,
ESP Laboratory,
7559 Santa Monica Blvd.,
Los Angeles, CA 90046
(213) 876-9984

Mark-8 hardware, corrections; add-ons, and software:
Ronald Carlson,
14014 Panay, #255,
Marina del Rey, CA 90291

We have a couple of unusual additions to the list of coordinators this month. In the area of computer applications in amateur radio we have not just one lucky person, but an entire club. AMRAD, the Amateur Radio Research and Development Corporation is a Washington DC area club which is very much into computing. Much of their activity these days involves computers and they serve as an interface with computer interests in their area. You may recognize them as one of the sponsors of the Winterfest Ham Conference.

The AMRAD president, Paul Rinaldo, has been a ham since 1949, he has written several articles and authors a regular column, he has been an officer in several clubs, has organized a number of technical symposia, etc., etc. However, he wants us to finger AMRAD, not himself, as coordinator.

We also have another first in the area of medical applications – a co-coordinator Dick Moberg wrote us the following:

"I would like to serve as a coordinator for medical applications of microprocessors. Unlike the Biofeedback and Biorythms groups, which are oriented more towards 'exploring human potentials', the medical applications group would concentrate on micros in health care, medical research, rehabilitation, and preventive medicine.

My particular interests are in using microprocessors as replacments to augment various functions of the nervous system. I am working on an aid for epileptics and also on the possibility of restoring locomotion to paraplegics.

As for myself, I am a graduate student in bioengineering at the University of Pennsylvania and am doing my thesis research at Jefferson Medical College (Dept. of Neurosurgery). I am also a freshman medical student at Jefferson. I am president of the Philadelphia Computer Society, which was started early this summer and now has close to 100 members.

I coordinate medical applications for the Philadelphia Area Computer Society and have a list of people working in this field as well as interested people and also a collection of articles, etc. on the subject. I would be happy to share this with others as I do now with our application exchange."

Dick has also expressed interest in getting a medical applications newsletter started. Contact him if you'd like to participate.

Our third new coordinator this month is Bob Keene, who is interested in computer applications in translating and teaching (natural) languages. Bob's background is varied (a man after my own heart). He has worked security, production engineering, photography and electronics since 1952, and became interested in languages while living in Mexico during the early 1960's. He is also interested in Braille printers and does freelance research in the general field of education.

We didn't get Glenn Norris' background written up yet – wait until next time. In the meantime, contact him if you are into robots.

Proposal for a new SCCS Member Discount Plan

By Gene Murrow
Secretary, SCCS

SCCS Board member: Ross Mehl and Secretary Gene Murrow are trying to put together a workable discount buying program for members. This article outlines a proposed plan. The Board will probably adopt this plan if they don't get opposing feedback (use the fast feedback poll or write) from the members within the month.

Gene, who wrote this proposal up is the president of Computer Power and Light, the first company to recognize the need for, produce, market and support a fully integrated, ready to plug in and use personal computer. He has also been very active in SCCS, serving on the Board of Directors and as Secretary.

Background

Everyone agrees that one of the most important functions our Society can perform is to enable members to purchase "computerware" at discount prices. What makes this a realistic objective is that we are a large, sophisticated group and thus an attractive market for any manufacturer, distributor, or retailer.

In the past, SCCS had organized a "group purchase" plan to exploit the discounts offered to quantity purchasers.* Unfortunately, the plan embodied several fatal flaws, among them:

1. SCCS had to act as a distributor/retailer, which required Herculean efforts on the part of volunteers

2. SCCS grossly underestimated the costs associated with its ordering, accounting, and distribution efforts

3. SCCS was at the mercy of unscrupulous vendors who did not fulfill commitments and in some cases effectively stole large amounts of money from the Society (the great majority, thankfully, were first-rate and helpful beyond the call of duty)

Because of these problems, "group purchase" was suspended, and deposits placed by members for goods are being refunded. We must now organize a new member discount purchase plan that avoids these pitfalls. Board member, Ross Mehl, suggested several months ago that SCCS use existing retailers to help implement such a plan. As Board members came to realize that the crux of the problem is that the Society is *not* in the merchandising business (unless someone with the business head of Thomas J. Watson and the integrity of Lincoln is willing to volunteer 60-80 hours a week to the cause) and that we might be able to lean on the expertise and on-going operations of numerous entities that *are* (such as computer stores), the idea gained ground.

Being a love-at-first-byte computer hobbyist, a computer store owner, and a glutton for punishment, I set myself the task of drafting a new discount plan for members. It is presented below. Read it, think about it, de-bug it. Let us know what you think about it. The SCCS Board wants to act soon, but we need your guidance.

The Plan

Retailers, distributors, and manufacturers periodically submit to SCCS a list of merchandise they are willing to sell and deliver within 30 days to members at a discount of at least 10% off their regular prices. Each month's list of available merchandise is published in SCCS

*Through SCCS Group Purchase, members purchased over $150,000 worth of equipment at significant savings.

Interface with an attached order form. Besides listing the merchandise, the vendor indicates how he would deliver it to a member; the options are: ship, pick-up at the vendor's place of business, or pick-up at a local computer club meeting. For example, a Chicago-based vendor could offer to ship to any member outside the city, but deliver to local members at the regular meeting of the Chicago chapter (when one gets organized!) or other club.

A member orders items by filling out the form, checking which of the available delivery options he will use, and mailing it to SCCS, *with no money*. SCCS simply logs the orders in, and accumulates all orders for a particular manufacturer, distributor, or store for a period of 30 days. SCCS then notes the total dollar amount of the orders and forwards them to the vendors (making multiple copies in the case of several vendors on a single form).

The vendor then has 30 days to deliver the goods, C.O.D. At the end of this thirty day period, SCCS bills the vendor for 3% of the total order as a handling charge and contribution to the Society. For each item ordered, the vendor must supply the 3% or evidence that the ordered item was refused, within 30 days. Failure to adhere to the terms of the plan will cause a vendor to be dropped.

Sample Forms

Since I am connected with Computer Power & Light, Inc., and we are enthusiastic about participation in such a plan, we'll stick our necks out to illustrate these sample forms with a typical offering.

Vendor: Computer Power & Light **For Publication:** April
Address: 12321 Ventura Blvd.
Studio City, CA 91604
Check Delivery Options:
Ship_____ **Pick-up at Vendor**_____
At Meeting (Name Meeting) L.A. general

Item	List	Member Pr.	Member Disc.
– Novation acoustic modem	295.00	236.00	20%
– COMPAL-80 16K computer with terminal	2300.00	2070.00	10%
– COMPAL ASR33 keyboard	165.00	125.00	25%
– Sanyo VM 4092 9" monitor	185.00	160.00	14%

Sample Vendor Submission List

Member Name: Gene Murrow **List Date:** April
Member Address: 2385 Roscomare Rd.
Los Angeles, Ca. 90024

Item	Vendor	Delivery
COMPAL-80	Computer Power & Light	Pick-up at meeting
Sanyo monitor	Computer Power & Light	Pick-up at meeting

"I understand that terms are C.O.D. and that if I am to pick up any items, I shall do so within 30-60 days from the publication of this form."

Signed_____

Sample Order Form

The Advantages

1. SCCS's volunteer help does not have to handle or account for money nor arrange distribution. This is done by professionals.

2. Vendors from all over the country (or world) may participate, and members can look forward to local pick-ups where possible.

3. The published lists will keep vendors competitive. Vendors who cannot offer competitive discounts will naturally drop away from the system (which may be fine with them). On the other hand, a Chicago based hobbyist, for example, may be willing to order an item listed by a local vendor at less of a discount than that listed by a remote vendor because he could pick up the item rather than await delivery.

4. Local chapters could take over the order receiving/forwarding part of the operation for their own members and retain the 3% to fund local activities.

5. SCCS members are immune to rip-offs since there's no money up front. Also, they are assured of prompt delivery. Vendors who renege or who knowingly list "unavailable" merchandise will be dropped.

6. Vendors get low-cost publicity for their operations, and have a forum to advertise special deals. Perhaps, after say one year of good service, a vendor could be issued an "SCCS Approval" sticker/logo for use in his advertising and other promotions.

Known Bugs

I've found one so far. A member could approach a listed vendor and purchase an item at the listed discount directly, saving the vendor the 3% charge. The only fix I see is good faith. The vendor is getting exposure under the plan and should be willing to allocate 3% of his discounted selling price. If this happened often, SCCS would once again start losing money on the program (the listings/forms themselves would eat up perhaps 3 full pages in the magazine), and we'd all be back to square one.

Well, there it is. We hope retailers, manufacturers, distributors, tinkerers, consumers, etc., respond with constructive criticism. Please write to our editor, Larry Press, at the magazine with your comments. Let's get a powerful, workable, and bomb-proof plan up and running that benefits and protects all.

A Chess-Playing Computer Program

By Randy Miller

Regardless of your interest in chess, you should read this article by Randy Miller, for it is a very clearly written description of the overall design of a complex program. As such, you will learn something of program design, of the centrality of representation decisions, and of communication between independent modules. **Interface** ***and other hobbyist magazines have carried numerous articles on the specifics of programming in BASIC, assembly language, etc.; but none of us has yet to address the more difficult and important topics of the process of designing complex programs and data structures and of programming style. We hope to do so, and in an indirect way, this article is the start.***

If you happen to like chess, don't despair—this article is about chess playing programs. It is written at a high level, independent of programming language and any specific implementation.

Randy is currently a student at Arizona State University. You may have seen him this past March at the World Altair Computer Convention at Albuquerque where he demonstrated his Altair playing chess. This article is a description of how that program worked.

If you would like a listing and a copy of the program (written in Altair 8K BASIC) on a Tarbell Cassette, send $6.00 to Don Tarbell, 144 Miraleste Drive #106, Miraleste, CA 90732.

Randy Miller
may be reached at:
1010 East Lemon #5
Tempe, Arizona 85281

A good chess player can look at an overall board position and give an evaluation as to which side has the advantage. He considers many items, perhaps some unconsciously, which leads him to make an opinion about the board. Can we program a computer to play chess and be able to make this kind of evaluation? What follows is a discussion of the structure and operation of a simple computer program to play a game of chess.

We intend only to give ideas which might provoke further consideration by the reader. We will discuss the program as if it were written in any common high-level language. We will always be discussing and thinking in terms of the computer, so the two players will be called the "computer" and the "opponent".

The Board and The Pieces

First, we need to tell the computer what a chessboard is. We'll use an 8 by 8 matrix called "B". Each element in the matrix represents a chessboard square. For simplicity, a matrix element such as B(1,3) will be called square #13. Thus, squares #11, #81, #88, and #18 are the four corners of the board and B(1,1), B(8,8), and B(1,8) are the formal names of the matrix elements. (See Figure 1) We'll assign numbers from one to six to represent each piece as follows:

1 = pawn

2 = knight

3 = bishop

4 = rook

5 = queen

6 = king

Y \ X	1	2	3	4	5	6	7	8
1	11	21	31	41	51	61	71	81
2	12	22	32	42	52	62	72	82
3	13	23	33	43	53	63	73	83
4	14	24	34	44	54	64	74	84
5	15	25	35	45	55	65	75	85
6	16	26	36	46	56	66	76	86
7	17	27	37	47	57	67	77	87
8	18	28	38	48	58	68	78	88

Figure 1

The value will be positive if the piece belongs to the computer and negative if it is the opponent's. The board position with the initial set-up is shown in Figure 2. We can tell what piece is on any square, B(X,Y), by taking the absolute value of that element. We can tell which player the piece belongs to by taking the sign, SGN(B(X,Y), of that element.

COMPUTER

4	2	3	6	5	3	2	4
1	1	1	1	1	1	1	1
−1	−1	−1	−1	−1	−1	−1	−1
−4	−2	−3	−6	−5	−3	−2	−4

OPPONENT

Figure 2

The Moves of The Pieces

The various moves of the pieces can be given as functions of the number of the square the piece is on when it begins that move. For instance, let's say there is a rook on square # A. Then A+1 represents a move towards the opponent's side of the board of one square. A+2 represents a move of 2 squares, and so forth. A+10 gives a move toward the side of the board and A−10 is toward the other side. The four functions that generate the moves in the four possible directions for a rook are:

(1) F1(X) = A + 1K
(2) F2(X) = A − 1K
(3) F3(X) = A + 10K
(4) F4(X) = A − 10K

where A is the square the piece is on and K is an integer specifying how many squares the move is to be.

But let's suppose that a rook is setting on square # 18. By applying functions # 1 and # 3 we can get the rook to move in those two directions, but when we try to apply functions # 1 and # 4, we get numbers that are off the board. So, before we apply any of the functions, we must place a limit on the range of K, determined by how close to the edge the piece is. The limits on K for the above rook functions are:

F1(X) = A + 1K K = 1 to (8 − Y)
F2(X) = A − 1K K = 1 to (Y − 1)
F3(X) = A + 10K K = 1 to (8 − X)
F4(X) = A − 10K K = 1 to (X − 1)

where X and Y are the X and Y components of A, i.e. the first and second digits of A. In any case where K = 0, that function cannot be used because the piece is on the edge.

There are two types of legal moves. The first type, which we shall call "raw moves" are the moves which a piece has the capability to make. We can simply apply the appropriate movement functions and check to see if any obstacles are in its path. The second type of move, called a "restricted move" is one which is completely legal to make in the game. Consider the board position in Figure 3. Black has a knight on square # 52. Let's examine the legality of Black moving that knight to square # 33, where the asterisk is. It is clear to us (and if the computer would apply the appropriate functions it would be clear to it too) that a knight does have the movement capability to jump from square # 52 to # 33. So, it is a legal *raw move*. But in actual play, it could not make that move because it would expose its own king to check by White's rook. So it is not a legal *restricted move*. Also, Black's bishop on square # 65 can make a legal *raw move* to square # 21, but it is not a legal *restricted move* since it would be capturing a piece of its own color. It takes a legal restricted move to immediately threaten an opponent's piece, but just a legal raw move will check a king. Let's say that a piece wants to move from square # A to # B. To test whether the move is a legal raw move, we see if B is one of the appropriate functions of A, and if so, if there are any obstructions between A and B. To test if the move is a legal restricted move, we must see if that move would leave the mover in check, which involves testing for as many legal raw moves as the mover has pieces.

	1	2	3	4	5	6	7	8
1		R_B			K_B			
2				P_B	N_B	P_B		
3			*					
4								
5			N_W			B_B		
6								P_W
7					R_W		P_W	
8							K_W	

Figure 3

Strategy

We must now concern ourselves with the problem of strategy. How does the computer decide on a move? We won't even start to discuss the many varied aspects of computer-applied chess strategy. We will merely illustrate the general method that's easiest to understand and program.

Figure 4 shows a diagram of the steps our program will take to arrive at a suitable move. Whenever it is the computer's turn to move, it will have, on the average, 32

moves to choose from. It will take each of the possible moves and make that move on a temporary board, matrix TM. An evaluation subroutine will determine how well off or how bad off the resulting board position leaves the computer. It will assign a value to that possible move indicating how high an evaluation that board position received. After it has done this for each possible move, it will go back and pick the move which received the highest rating, or if the two highest ratings are nearly equal, it will choose between them at random.

Let's suppose the evaluation section is removed. Each of the possible moves would then naturally have the same rating (zero) and the computer would randomly choose from the list. We see, then, that the evaluation section can be as long or as short as the programmer desires. If the evaluation section is short and only a few tests are used in the evaluation, the computer will play a weak game, but it will compute each move fast enough to be used on small computer systems. If there are many tests in the evaluation, the computer will play a better game, but it will be necessary to run it on a faster computer in order that the game not be too boring. We will describe a chess program that is so versatile as to allow the programmer to insert his own evaluation section with the greatest ease.

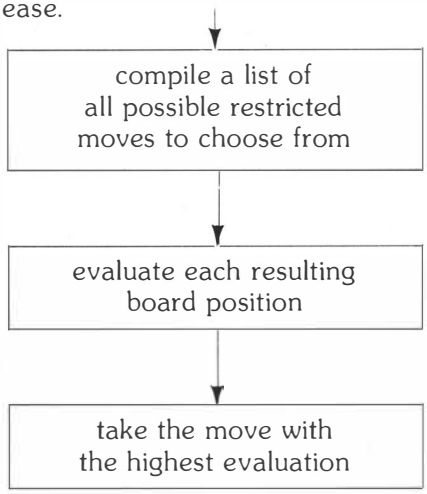


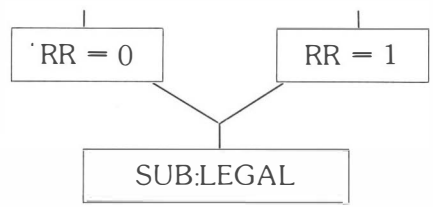
Figure 4

Program Structure

The general operating structure of the program is shown in Figure 5. There are six parts to the program: MAIN, EVAL, IN, OUT, SUB:LIST, and SUB:LEGAL. EVAL can be a function and the rest are subroutines except for MAIN, which is the main program. A discussion of the parts and their operation follows.

Sub:legal

This subroutine takes in five arguments: X1, Y1, X2, Y2, and matrix TM. Matrix TM is a temporary board position which the subroutine will use. X1 and Y1 are the coordinates in matrix TM where some piece is located. SUB:LEGAL will determine if that piece on TM(X1, Y1) can legally move to the square given by X2, Y2, i.e. TM(X2,Y2). If the move is legal, LG is returned as 1, and if illegal, 0. This subroutine can determine legality in either the "raw" or "restricted" mode. We use the variable RR inside the subroutine to show which mode we want the operation in. If RR equals 0 then we have operation in the raw mode, and if RR equals 1, then it operates in the restricted mode. We can either pass RR as another argument to the subroutine or we can use two entry points as shown:



One entry point would set RR to 1 and the other would set RR to 0. In the raw mode, SUB:LEGAL merely checks to see if the second square is a function of the first square and if there are any obstructions between the two. In the restricted mode, it also checks to see (1) if there is a piece on the second square; if there is, it must be of the opposite color and not a king; (2) the move cannot leave the mover in check. To check for condition (2) the subroutine will temporarily make that move in matrix TM, find where the king is whose color is the same as the color of the piece that was moved. One by one, pieces of the opposite color are found and SUB:LEGAL calls upon itself to see if any of the pieces can access the king in the raw mode. If the king is safe and condition (1) is met, then that move is a legal restricted move and LG is set to 1.

Sub:list

Three arguments are given to SUB:LIST: matrix TM, X and Y. X and Y are the coordinates in matrix TM where some piece is. Working in either the raw or restricted mode, SUB:LIST will compile a list of all moves that the piece on TM(X,Y) can make, put the list in matrix MV, and set N to the number of moves compiled. Let's suppose matrix TM represents the board position as it is in Figure 3. Let's set X and Y to 2 and 1 respectively, and call SUB:LIST under the restricted mode. First the subroutine would list all the possible raw moves that the rook on TM(2,1) could make. The list, matrix MV, would look like this:

Matrix MV

	1	2
1	21	22
2	21	23
3	21	24
4	21	25
5	21	26
6	21	27
7	21	28
8	21	31
9	21	41
10	21	51
11	21	11

This list shows that the piece on square # 21 can make a legal raw move to each of the squares # 22, # 23, # 24, etc. However, we specified *restricted* moves, so for each of the 11 moves in matrix MV, the subroutine will check for the additional two conditions explained earlier. When checking to see if a

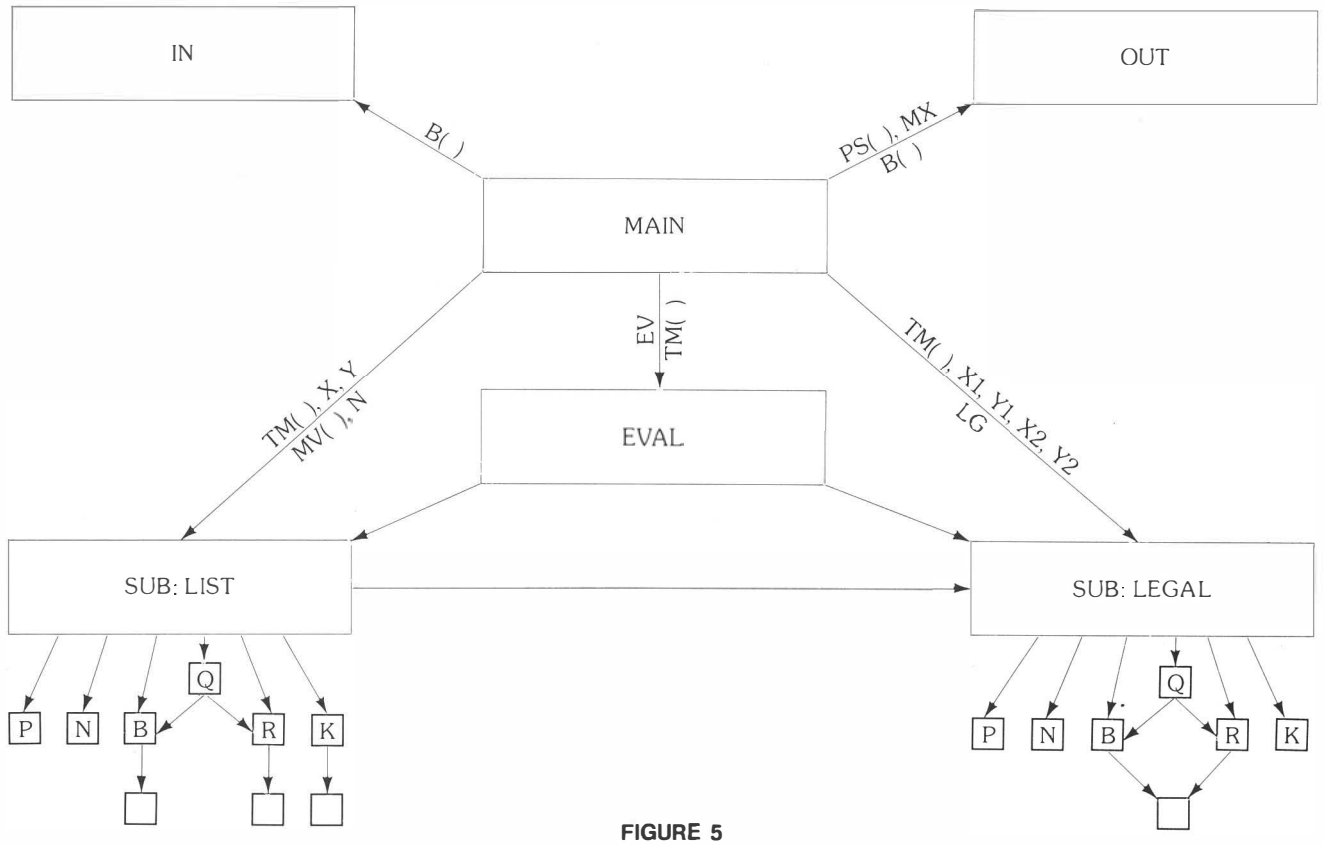


FIGURE 5

move leaves the mover in check, SUB:LIST will call SUB:LEGAL in the raw mode. After performing the additional tests, the subroutine will determine that the tenth raw move (from square # 21 to # 51) is not a legal restricted move because the second square is occupied by a piece of the same color. Those two elements in matrix MV are subsequently set to 0. However, N still remains equal to 11. The element pairs that are set to zero are not removed from the list because the program segment from which SUB: LIST is called will probably add matrix MV to a longer list of moves at which time the element pairs that equal zero can be dropped.

Main, In, Out

MAIN is the main program which calls each of the subroutines or functions when needed. Inside MAIN is matrix B which is the current board position. When it is the opponent's turn to move, MAIN simply calls on IN which takes care of that duty by testing the inputted move for legality and making the appropriate change in matrix B. MAIN sets matrix TM equal to matrix B and prepares a list of all it's possible legal restricted moves to choose from by calling on SUB: LIST for each of its pieces. When matrix MV is returned for each piece, the non-zero element pairs are added to the complete list in matrix PS (PS for PoSibilities). Matrix PS in MAIN then has a complete list of all the possible moves to choose from. Starting with the first possible move, MAIN alters matrix TM as if that move had been made and calls on EVAL. EVAL takes matrix TM and by performing a number of tests, determines which side has the advantage. EVAL will set EV to a value within arbitrary limits, say from −100 to 100, to show which side has the advantage and how strong that advantage is. EV is returned to MAIN which assigns it to an element in matrix PS alongside the associated element pair. When each possibility in matrix PS is evaluated, MAIN then indicates the one with the highest evaluation by setting variable MX to the row in matrix PS which contains the pair of numbers representing the selected move. Matrix PS and MX are sent as arguments to OUT which makes the move, changes matrix B accordingly, and returns to MAIN which immediately calls on IN, starting the cycle over again.

Final Note

We won't discuss EVAL other than to give some obvious points. The programmer has at his disposal the power of SUB:LIST and SUB:LEGAL when writing the evaluation section. He can use his imagination and write a huge evaluation section if he so desires, including huge possiblity trees, pattern recognition routines, etc. Or he may wish to make it short and simple enough so he can be assured of winning most of the time. Whatever the case, we're sure the user will find many years' worth of material and ideas to work on.

Homebrew

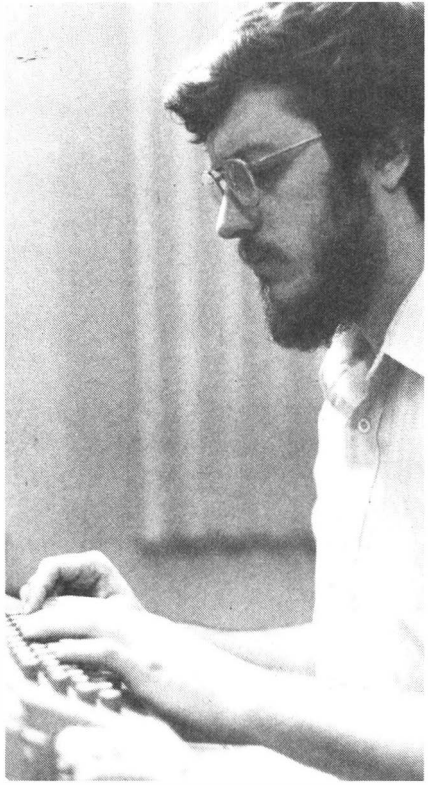
This article highlights the features, workmanship and design of Larry Rossi's custom designed home computing system. A homebrew project certainly requires more effort than a kit, but the value of the learning experience is proportional to the effort.

We would like to hear of other homebrew projects - whether entire systems such as Larry's or add-on boards for commercial systems.

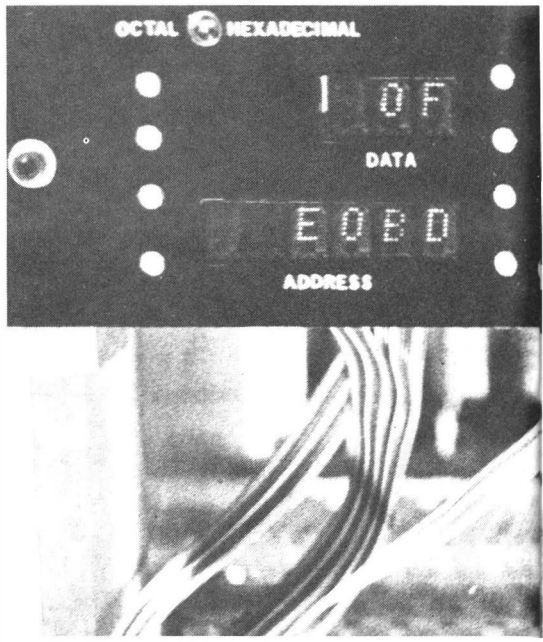
We would also like feedback from the members on articles such as these. Are you interested in custom systems and boards? In the case of Larry's system, we decided to run a general article, rather than extensive plans. Would many of you be interested in a Xerox booklet with detailed schematics?

Larry Rossi is an SCCS member who works on memory testing at the Rolm Corporation in Cupertino, California. Larry studied engineering at Cornell University, where he also got into a lot of programming and worked on electric cars. He built this machine for the design experience, not for any particular application. As a matter of fact, he's only loaded BASIC once, and then all he did was compute the square roots of the integers from 1 to 10! Larry is 25 years old and really pleased to be single.

Larry Rossi
may be reached at:
Rolm Corp.
18922 Forge Way
Cupertino, CA 95014



Larry Rossi's custom designed 8080 system.



With all of the ads, publicity and articles about the newest kits and pre-assembled machines, one can lose sight of the fact that there are still people designing and building unique, homebrew computers. This morning, we had a chance to see and play with Larry Rossi's 8080-based homebrew machine, and were very much impressed.

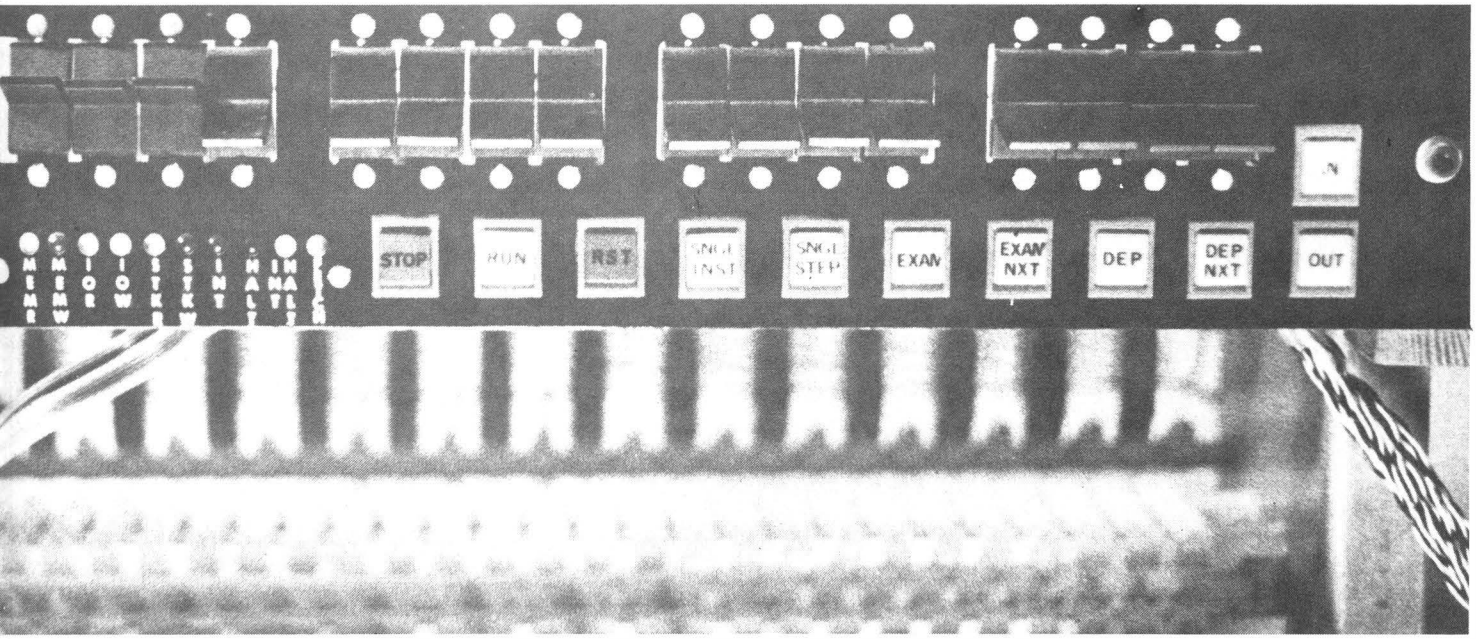
We've been around a few electronics nut's home/workshops and the first thing that struck us about Larry's place was how clean and organized it was. The next thing we noticed was what a nice job of construction and packaging he had done on the computer which was sitting quietly on his workbench – no jungle of wires, cables, jumpers, alligator clips, cigarette butts, aspirin bottles, etc. – it was all in a nice clean rack with a shiny front panel.

As you see in the accompanying photograph, there are a number of cards in the rack below that shiny front panel. They include 22K of static RAM, 10.5K of PROM, an 8080 CPU card, a TTY interface and two front panel cards (one for the display and one for the control switches). All are Larry's own design and construction. They plug into a 44 pin bus and he has 32 card slots, most of which are still unused.

Front Panel Functions

Now, look back at the photograph of the front panel and examine it carefully. The first thing you notice is that Larry has taken the extra care to print the meanings of the various switches and indicators, rather than scrawling them on masking tape with a felt-tip pen or using a "dymo" label maker. That's a good sign. Next, you begin to read a few of those switch and indicator names, and there are some pleasant additions to the usual hobby kit front panel. For a start, address and data readouts are not binary, but either hex or octal (the radix is selected with a switch located just under the displays). There are also a number of control functions not found in most hobby kits. These are:

1. Single Instruction – Causes the CPU to fetch and execute an entire instruction, stopping at the next M1 state, rather than going only one state at a time.
2. Output – Transmits the bit pattern set in the high-order address switches to the output port designated by the low-order switches. This is useful for debugging peripherals and for punching arbitrary codes in paper tape.



3. Input-Displays the information received from a selected port directly, without disturbing the status of the CPU.

A final nifty feature on Larry's front panel are the CPU status indicators. Instead of merely showing the 8 status bits in raw form, he decodes them and shows us which of the 10 possible operations (fetch, memory read, etc.) the CPU is performing.

Below The Front Panel

One is immediately impressed by the workmanship and evident careful planning reflected in the electronic assembly. Larry made PC boards for the memory and, again, went to the slight extra trouble of putting a quad DIP switch on each board to specify its place in the memory space rather than soldering in jumpers. The rest of the boards are all neatly laid out and hand wired (soldered, not wire wrap). Looking at nice craftsmanship and attention to detail like this reminds us of the meticulously chromed running gear of a prize-winning hot rod.

Larry designed it all himself, but carefully studied Intel applications manuals as well as the Altair design. He opted for an Intel-like 44 pin bus, giving up compatability with all of the readily available plug in accessory kits.

His major design goal, which he met, was to be fully "synchronous" – that all events are triggered by appropriate CPU and clock pulses. He is able to insure that data is always stable on the data lines *before* any sort of clock pulse, which will cause them to be "looked at", arrives. All tri-state buffers on the data bus remain in the high impedance state until data is stable, then the appropriate ones are enabled. He would not allow a situation where, as in the Altair design, buffers are enabled at the time of status readout and data is not ready until after the access time of the memories. By conforming to this constraint, Larry has been able to avoid bus terminations and noise problems. The data bus is about 30" long and the wires are close together, but he has had no problems with noise.

Larry has also opted for centralized power regulation, with remote sensing at the backplane, rather than on-board regulators. His reason for this is thermal – he wished to have a large heat sink and fan in one place in order to simplify the design of his cooling system.

Finally, the front panel is fully buffered and the cards which support it plug into the rack just like any others.

Future Plans

That fairly well highlights Larry's machine. He has plans for two major additions at present. Most immediately will be a hardware breakpoint module. He is designing a card which will enable the user to specify, in much greater detail than is possible with a usual software breakpoint facility, the conditions under which an interrupt and jump to the debugging monitor (in PROM) should occur. For example, he will be able to specify the machine cycle and address bus contents which must occur for a breakpoint interrupt to occur.

His other future project is a multiprocessor system with a front-end machine to handle peripherals and a "number cruncher" in back. Anybody old enough to remember the old shared-file and direct-couple systems from IBM?

Larry also plans to document this machine completely for those who might want to build their own or study it for tutorial purposes. Look for more detail in future issues of Interface and perhaps a separate booklet on his home-brew machine.

Back-gammon, Anyone?

By Phil Feldman and
Tom Rugg

Last month we gave you a look at Danny Kleinman and Steve Grumette's backgammon system. This month Tom Rugg and Phil Feldman describe the program in more detail.

Tom and Phil are Associate Editors of SCCS* Interface *and co-authors of our* Games and Things *column. Both are into games of all sorts (Tom "forces" his Explorer Scout troop to play with computers) and both have been professional programmers for ten years. Tom works on application programs, conversion and optomization at General Telephone Co. and Phil is a scientific programmer and mathematical model builder at TRW.

Many computer hobbyists, especially "game freaks", eventually want to tackle the development of a program that plays a complex high-level skill game. The task is very difficult, involving constant setbacks, reformulations, and discouragements. This month we will look "behind the scenes" at one such program developed for a microcomputer – a backgammon playing program nicknamed "Jack." It is part of a video game developed by Danny Kleinman, Mike Gilbert, Steve Grumette, and their machine "Jack Gammon," who were introduced in a feature article about this project which appeared in last month's issue. If you haven't read that article yet, it would be a good idea to do so first because some of the terminology used in this column will be explained there. To get the most from this column and the article on "Jack Gammon", it will be necessary to have some understanding of the rules and terminology of backgammon. We don't have the space to explain them thoroughly here so, for those who don't know them, we suggest that you refer to any of the available game books or ask a friend.

Jack's Basic Problems

The task of developing and debugging a program such as Jack is obviously best done in a high-level language. For microcomputers, we're pretty much restricted to Basic and this was the language with which Jack was "born." However, after the program was fairly established, it was all converted to assembly language to effect a great savings in both execution time and memory required.

Figure 2 shows the various decisions and operations Jack has been programmed to do when it is his turn to roll the dice. It all looks simple enough; but countless hours of work have been expended on the programming required for two elements of the flowchart. The "SHALL I DOUBLE OPPONENT" is only a yes or no decision, yet Jack must have fine judgment to make it wisely (what are the chances of gammons or backgammons? for example.) The "SELECT MOVE", involves similar difficult judgments, requires Jack to pick his best move after a given dice roll. The rest of this article will be devoted to what goes on in programming that innocuous looking little box on the flowchart.

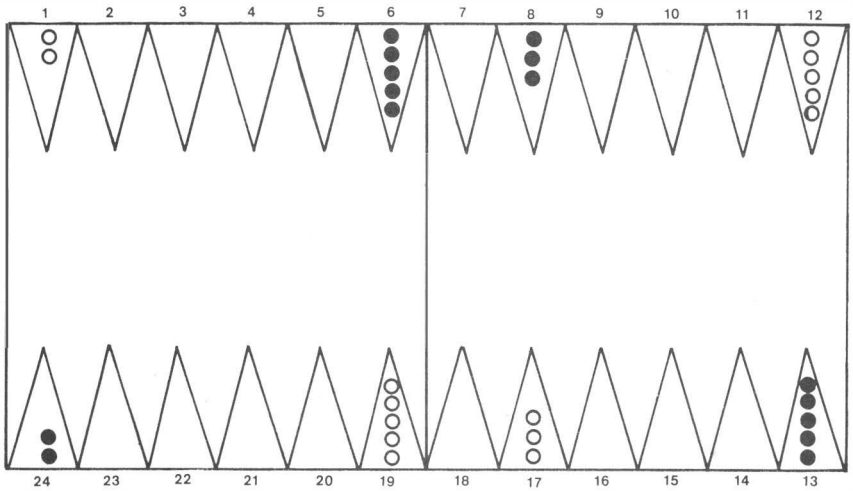
At the heart of most game-playing programs of this type is the *static evaluator* (SE). It can be thought of as a subroutine. When called with the parameters of the current position for backgammon (these would be position of the men, value and owner of the cube, whose turn to roll the dice, etc.) it will return a number. The higher this number, the more the position is in the "computer's" favor. Thus to pick his best move after a given roll of the dice, Jack simply figures out all the possible legal moves, calls the SE for each possible resultant position, looks for the highest number, and makes the corresponding move.

Sounds easy, doesn't it? Well so does balancing the budget until you try it. Lets look at *some* of the details and problems involved.

Representing The Game

Fortunately, the representation of any board position is fairly straightforward. In Basic, the 24 points will be represented by an array, say B(1) through B(24). The value of each element in the array will be the current occupancy of that point. It may be a number from -15 to +15. If positive, Jack has that many men on that point. If negative, his opponent has that many men on that point. And, of course, if zero the point is unoccupied. Men on the bar will be represented by adding another element to the array on each end. At the low end, B(0), will be the number of men Jack has on the bar (this number can never be negative) and

Figure 1. The initial board configuration



(a) An actual board and men

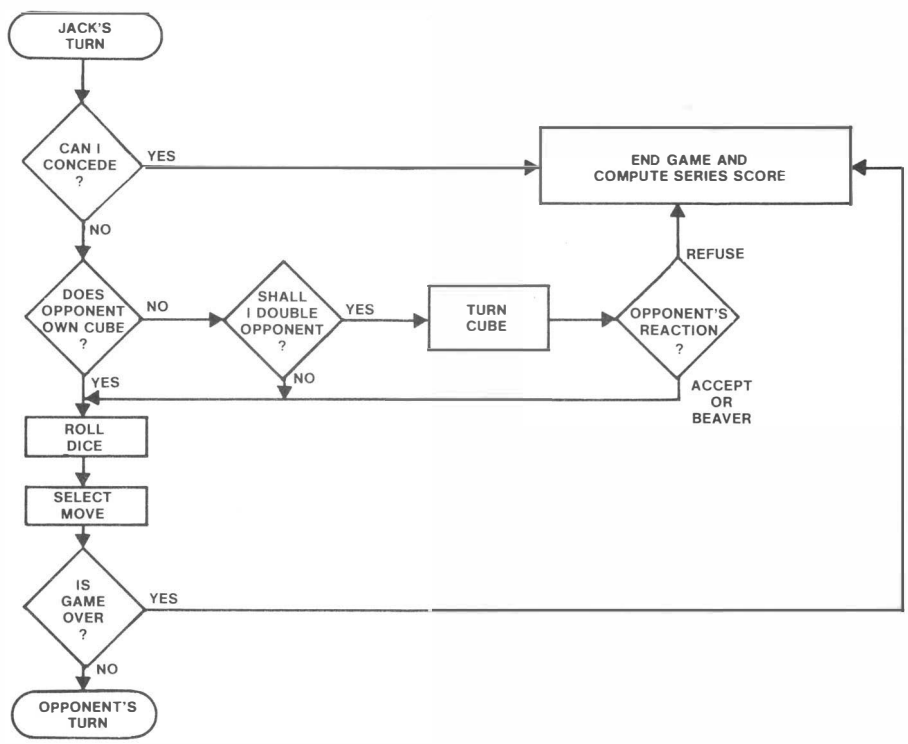
I:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
B(I):	0	2	0	0	0	0	-5	0	-3	0	0	0	5	-5	0	0	0	3	0	5	0	0	0	0	-2	0

(b) In BASIC the array B(0) thru B(25) (see text)

MEMORY LOCATION IN HEX	WORD CONTENTS IN BINARY
0 0	
0 1	00 01 00 10
0 2	
0 3	
0 4	
0 5	
0 6	00 00 10 11
0 7	
0 8	00 00 11 01
0 9	
0 A	
0 B	
0 C	00 01 01 01
0 D	00 00 10 11
0 E	
0 F	
1 0	
1 1	00 01 00 11
1 2	
1 3	00 01 01 01
1 4	
1 5	
1 6	
1 7	
1 8	00 00 11 10
1 9	

(c) In assembler, 26 consecutive memory locations. The contents of words not shown is $(00010000)_2$ (see text)

Figure 2. Jack's Turn



at the high end, B(25), will be the number of men Jack's opponent has on the bar (this number can never be positive.)

The "assembly" language internal representation is a direct analog to this. Here the board is contained in 26 consecutive memory locations, say locations $(00)_{16}$ through $(19)_{16}$. The 8 bit word size is convenient. A "16" or $(00010000)_2$ will represent *no* men on that point. Successively larger numbers will indicate Jack's occupancy of that point – from one man $(00010001)_2$ to fifteen men $(00011111)_2$. Successively smaller numbers will indicate Jack's opponent's occupancy of that point – from one man (00001111)2 to fifteen men $(00000001)_2$. Figure 1 shows how the initial board is represented with these different methods.

A move is represented by a source point ("From") and a destination point ("To"). This yields an F-T pair for each part of a move. For example, Jack can take a 4 and 3 initial roll by going 1-5, 12-15 or 12-16, 16-19 just to name a few possibilities. Jack's moves (even from the bar) are always from lower to higher numbered "points" while his opponent's moves are always toward lower numbered "points." A bear off move will be represented by T having the special value 99 (e.g. 21-99).

Moving Right Along

O.K. So we have a given board position and a given roll of the dice. How do we just enumerate all of the possible legal moves? The flow chart (Figure 3) shows how Jack accomplishes this for a "regular" roll (i.e. not doubles. Doubles are handled similarly.)

Basically, the concept of "furthest man back" is used. From the given position the furthest man back is moved first, the next furthest next etc.

As each legal move is generated, the resultant position is evaluated. If it is the best found so far, it is saved by storing its move F1-T1; F2-T2. When all the legal moves are finally considered, Jack will have "remembered" which move he thought was best.

The original copy of the board is not destroyed. A copy is made in a work space and this is updated as the moves are generated. The following routines are referenced in the flowchart:

RESTORE-refreshes the work space back to the original board position.
UPDATE-updates the work space with the move F1-T1.
TAKE-tests whether a proposed move of a man (F-T) is legal.

Note that many constraints come into effect.

(1) If B(O) is positive, only moves with F=0 will be considered (men must be brought in from the bar before any other move can be made).
(2) Only if B(F) > O can a move be possible from F, (this expresses profound concept that Jack must have a man on F to be able to move from it!!).
(3) B(T) must be greater than or equal to -1. That is, the destination point must either contain one opponent man (-1), no men (O), or any number of Jack's men (1)-(14) to be a legal landing spot.
(4) A man may be borne off only if all of Jack's remaining men are on points 19-24.

Note that the same final board configuration may appear for more than one legal move of a given roll. For example, on a roll of 5 and 2 one man may move both numbers but take either one first. Which number was moved first would make a difference if a blot was hit on the first number taken. Thus, in general, both moves must be considered independently.

The Nitty Gritty

O.K. So we've had all this mumbo-jumbo about legal move enumeration etc. The crux of the problem is obviously in coding the SE. Well, this is correct, of course. The quality of Jack's play will be entirely dependent on how well Jack can evaluate the merits of one position over another.

Naturally, the exact algorithms used by the Gammoneers are considered proprietary. However, we can delve into several of the concepts they used and their implementation.

Basically, Jack looks into each position and checks it for a number of factors. The number of factors taken into consideration and how deeply they are explored is determined by the skill level requested for Jack's play. Let's look briefly now at a number of them.

One of the most elemental concepts in backgammon strategy is the race. It is obviously important to know who is closer to having all his men in his home board and ready to bear off. The total number of pips (or points) required to move all your men to the home board and off (assuming no wastage) is called the pip count. Jack keeps track of the current pip count for himself and his opponent at all times. The ratio between his count and that of his opponent has far reaching implications for such decisions as: whether or not to double, whether or not to accept a double, whether to try to maintain or avoid contact between the two forces etc.

Many other "counts" are also maintained by Jack. The "man count" is simply how many men each side has remaining in play. A separate man count by board quadrants is also maintained. Jack's strategy includes a special concept of pseudo distances. To understand this concept, consider these two positions in a final bear off. Position A: one man on the 2 point and one on the 5 point. Position B: one man on the 4 point and one on the 3 point. Both involve two men and the pip count of each is seven. Yet A is better because more dice rolls will bear off both men in A than in B. Jack recognizes this by a special pseudo distance scheme. Instead of one pip, the separation between

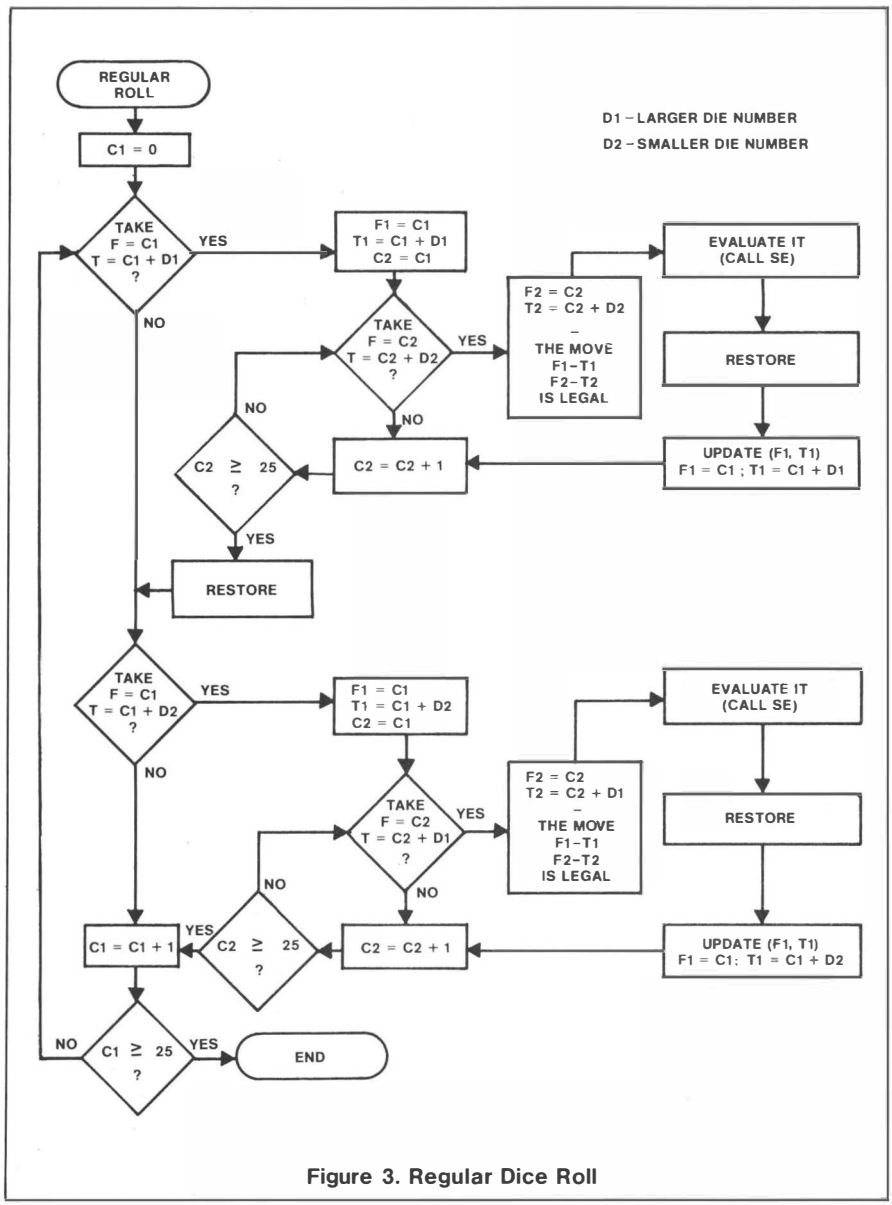


Figure 3. Regular Dice Roll

two consecutive points is considered to be one pip ± a small fraction depending on the two points involved. The "adjusted pip count" of position A would be slightly smaller than B. Thus Jack can distinguish certain positions of this type.

Another key strategic concept is board strength. Jack looks at the points he and his opponent have established and tries to determine their quality. Are key points occupied? Are chances of making them good? Who has the most number of points? How many blots are on the board and are they likely to be hit?

Closely related is the subject of priming. A prime is a number of consecutive points established by one side. Opponent's men trapped behind primes will have a difficult time passing over them (it will be impossible if the prime is 6 or more points long.) Jack looks to see the makeup of primes on the board. Is the prime broken? Are there opponent's men trapped behind the prime? Is the prime interrupted by an opponent's point or blot? Are men trapped behind the prime advanced to the edge of the prime or are they still far back? Is the prime in a home board with opponent's men on (or likely to be on) the bar?

The Last Hang-up

The subject of timing is tricky and occupies most of the current work on improving the program. The problem is that even though a position may be great in all other respects, it simply may be forced to fall apart by future rolls of the dice. Consider a back game (where one side falls deliberately way behind in the race in order to ambush his opponent as he is bringing his last men into his home board.) The timing must be just right to get a late hit while your own home board provides a serious threat to men on the bar. Jack must be taught to recognize when conditions are right for these kinds of things – a very tricky programming problem.

Jack contains many subroutines which evaluate the status of these concepts. They are all useful tools to decide whether one position is better than another. The trick, of course, is recognizing which concepts are most important for a particular type of position. For example, when much contact between the forces is still possible, establishment of primes is very important. But in a race, when no more contact is possible, establishment of primes is essentially irrelevant. Jack must decide which strategic elements are most important in each position, in order to determine what number the SE will output for that position.

Well, our position is that our number is just about up for this month. We hope this article has given you an appreciation of the difficulty and complexity involved in this type of program. It is certainly no simple matter to put "Jack in the box."

New Products

High Quality, Low Cost Monitor Kit

Circle No. 12 on Inquiry Card

The PICKLES & TROUT TVM-04 television modification kit makes it possible to obtain a quality video monitor at a low price (about $100, depending on the local price of the TV). The kit converts any Hitachi TV using the SX chassis (examples are model numbers P-03, P-04, P-05, P-08, P-53 and P-63) into a 12 inch monitor for use with EIA standard composite video signals. The modified set is capable of displaying over 90 clearly visible characters per line and will work equally well with white letters on a black background or black on white. Also, it can be operated either as a monitor or a television receiver by the flip of a switch. The kit is easily built and installed, and comes complete with a five foot video cable assembly and even a tool to adjust the width and height of the image. The TVM-04 sells for $20 postpaid in the 48 contiguous United States. Send orders and inquiries to PICKLES & TROUT, P.O. Box 2276, Goleta, CA 93018.

Low Cost Software

Circle No. 14 on Inquiry Card

TSC is pleased to announce the release of the world's first catalog dedicated to hobbyist computer software. It contains complete descriptions of over twenty programs for the 6800, six for 8080, and six for 6502. These programs include both games as well as many useful ones. All are written in assembly language, which means a high level language interpreter is not needed. Some of the titles are: HANGMAN, ACEY-DUCEY, SWITCH, HURKLE, SPACE VOYAGE™, KLINGON CAPTURE, MICRO BASIC PLUS, FLOATING POINT PACKAGE, DIAGNOSTIC PACKAGE, BATTLESHIP, and many more. The price of these programs range for $1.50 to $15.95, essentially the cost of documentation and handling. Catalogs are $.25 each and may be obtained from: Technical Systems Consultants, Box 2574, W. Lafayette, IN 47906.

The TSC catalog feels good and their prices seem fair. They also have a program of the month club.

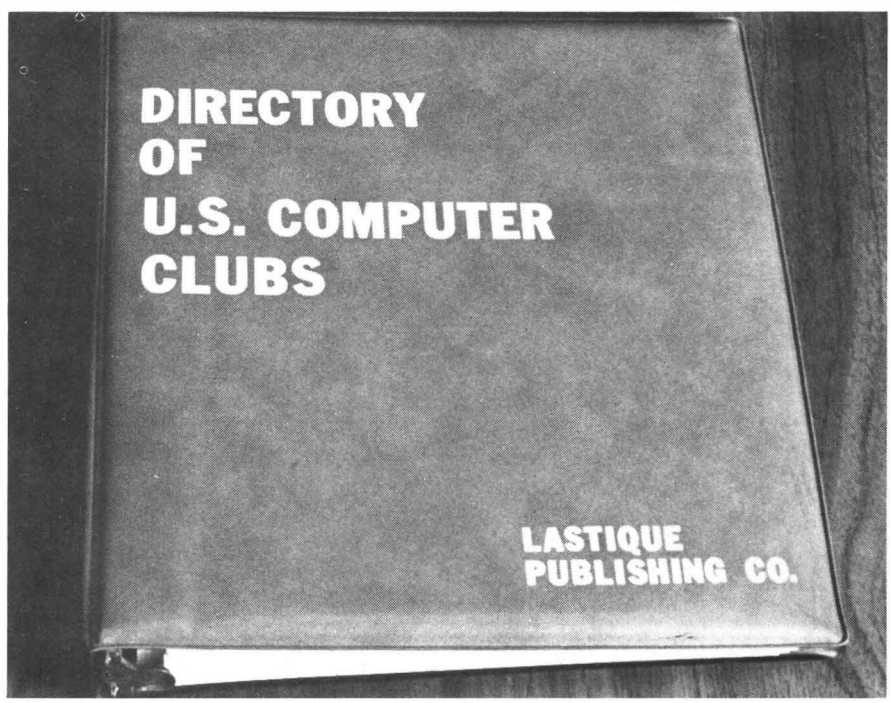
Directory of U.S. Computer Clubs

Circle No. 13 on Inquiry Card

This directory contains five cross-indexed sections:

1. A club profile section containing names, addresses, fees, size, etc.
2. A geographic locator section containing an alphabetical listing by state, by city of the clubs' location.
3. A special interest section containing a listing of applications and the clubs involved in them.
4. An equipment section listing of data processing equipment that is available to each club.
5. An articles & software section containing a listing of items published by club members.

It will be updated three times per year and costs $35.00. Contact Lastique Publishing Company, Box 1691, Austin, TX 78767, (512) 472-6723 for further information.



PDP-8 Compatable Computer From TLF

Circle No. 15 on Inquiry Card

The Data 12 is a complete, self contained 12-bit microcomputer with an integral 262,000 word random access tape drive. In addition to executing the instruction set of the Digital Equipment Corporation PDP-8E minicomputer, it also has instructions for floating point decimal arithmetic, numeric and character string input and output, block memory move and search, and push-pop instructions for recursive subroutine handling.

Fully assembled, the system sells for $1695– including 4096 words of user memory, serial terminal interface, tape controller with one drive, and a comprehensive tape operating system that includes both an unattended batch mode of operation and real time task scheduling capability.

The random access tape drive uses a pre-formated digital casette, and has an average access time of less than 25 seconds with bi-directional search speeds of over 100 inches per second.

Program preparation is handled by a powerful tape operating system whose components are a named file system for storage and retrieval of user programs and data, a keyboard monitor for communicating with the user, a text editor for program preparation, a comprehensive symbolic assembler, a disassembler and two loaders.

Program execution and debugging is controlled by a virtual debug program that allows examination, search and modification of memory with up to 16 simultaneous break points, without requiring any memory for itself. Utility functions for adding, deleting or copying files and listing the user or system catalogs are also provided.

Two high level languages are included with the Data 12–extended Basic and Phocal. The Basic used is a true compiler giving very fast execution times, and will execute a program approximately 6000 characters (about 300 lines) long in 4K of memory. It can save and recall named programs from the system tape, has a "chain" statement for linking programs to an almost unlimited length, has multi-dimensioned arrays, string handling, multiple statements per line, and allows up to 26 multi-line user defined functions.

The Data 12 is expandable to 32K of memory, and can be easily interfaced to external peripherals. Its' internal architecture is oriented around a 100 line bus structure, with six free slots for system expansion. 4K and 12K memory cards, a digital and analog I/O card and general purpose interface card are also available.

Delivery is 30 to 45 days. For further information contact TLF, Box 2298, Littleton, Colorado 80161, (303) 794-1634.

This looks like a powerful system for the serious hobbyist or commercial user. The software is extensive and said to be running now. Sure hope they can deliver and support the hardware.

40-64K Stand Alone Memory

Circle No. 16 on Inquiry Card

Prime Radix Corporation's 64K™ memory system is available at a very cost-effective price. And because it is a standalone memory system, you've got the advantage of greater flexibility not ordinarily available from add-in memory. Some of the features are:

The 64K™ comes assembled and tested with its own power supply, attractively housed in an aluminum cabinet, ready to plug into your system.

Psuedo-static operation: on board refresh clock-generator provides processor independent refresh with no wait states. The 300NS worst case access time enhances high speed operation.

Power/fail detection circuitry and battery backup will provide non-volatile memory (batteries are optional at extra cost).

The 64K™ is full buffered, presenting one TTL load to the memory bus.

The 64K™ is Digital Group and Altair compatible. A plugcard and cable will be furnished for the particular bus architecture you specify.

The minimum complement of memory is 40K BYTES, with starting address locations at 0K, 8K, 16K, or 24K. Prices are: 40K – $1490.00, 48K – $1580.00, 56K – $1670.00, 64K – $1750.00.

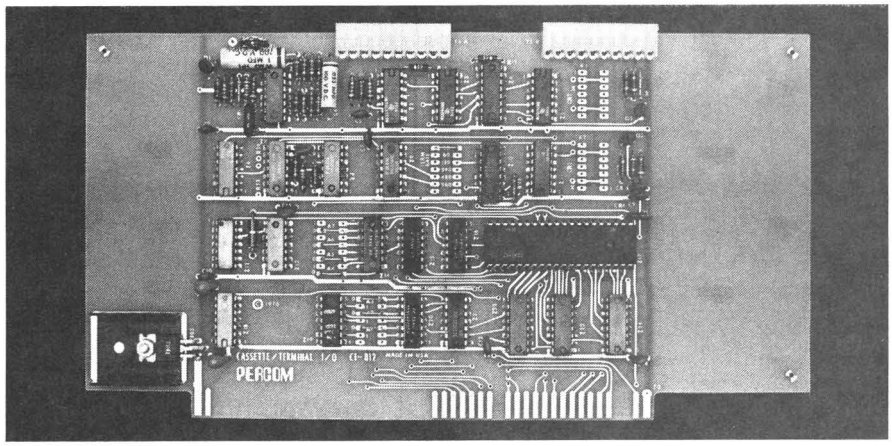
For information contact: Prime Radix Inc., Box 11245, Denver, CO 80211.

Go-Moku

Circle No. 17 on Inquiry Card

A program to play Go-Moku, with a complete set of supporting documentation is available for the 8080. The program plays a full (19 x 19) game, runs with either CRT or TTY output and requires 2.5K memory. Prices are $1.95 for a catalog and details, $4.75 for the users' booklet, $19.95 for the program and all documentation. Contact RBB Software Products, 125 N. Wade Circle, Anaheim, CA 92807.

New Products



Single PC Card for S-100 Bus Includes Both Cassette and RS-232 Interface Circuits

Circle No. 18 on Inquiry Card

PerCom Data Company introduced the first IMSAI/Altair compatible, dual cassette/terminal interface card. Designated the CI-812, the dual-function card combines interfacing functions normally requiring two or three PC cards.

The cassette interface phase encodes (Manchester/Biphase) at the KC Standard rate of 30 bytes/second, and at 60, 120, or 240 bytes/second for rapid loading of frequently used programs. In fact, the CI-812 is the only interface on the market today which provides both KC Standard and high speed phase encoding.

The cassette interface record and playback circuits are completely independent, and the card is patterned to include optional DIP reed relays—which may be ordered as a $10.95 kit—for program control of two recorder/players. This permits operations such as cross-filing.

The CI-812 companion circuit, an RS-232 terminal interface, is full duplex and provides for data exchange at 300 to 9600 baud.

The CI-812 has been designed to operate with existing user's software with little or no modification.

The CI-812 kit price is $89.95. Assembled, it costs $119.95, and an instruction manual is included. For further information contact PerCom Data Company, 4021 Windsor, Garland, TX 75042 (214) 276-1968.

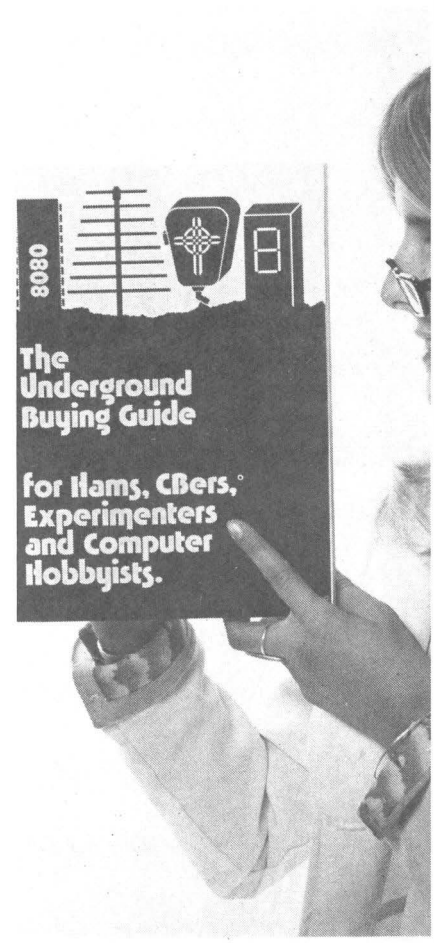
Microprocessor Hardware Floating Point Board

Circle No. 19 on Inquiry Card

North Star Computers, Inc. offers the FPB floating point unit, which performs decimal floating point add, subtract, multiply and divide with up to 14 digits of precision. The Model-A FPB has the Altair/IMSAI buss structure. The Model-B FPB is compatible with the Intel SBC and MDS buss structure. The FPB permits microprocessor systems to surpass minicomputers in processing power in applications where floating point operations are performed frequently. A typical 10 digit multiplication, when performed by the FPB, computes in 111 microseconds. The time is 5.5 milliseconds when the same operation is performed by the best 8080 firmware.

Furthermore, use of the FPB frees about 1K of program memory formerly allocated to firmware or software floating point algorithms. Merely replace your arithmetic routines with subroutines which transmit the operands and the result (at about 6 microseconds per byte) to the floating point unit.

A version of extended BASIC will be available for use in conjunction with the FPB. The price for either model of the Floating Point Board is $499. A kit version is available for $359. North Star Computers, Inc., 2465 Fourth Street, Berkeley, CA 94710; Tel: (415) 549-0858.



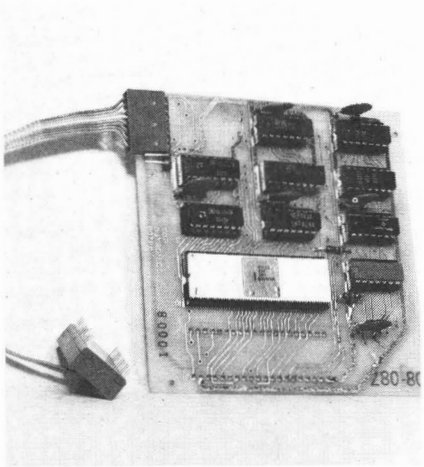
Underground Buying Guide

Circle No. 20 on Inquiry Card

A new directory has just been published that helps amateurs, CBers, experimenters and computer hobbyists locate equipment, parts, supplies and services. Over 600 sources of standard and hard-to-find gear are listed in the handy guide. Many of the 600 sources are mail order firms and discounters. All are firms that do business with electronic hobbyists.

The book has three sections: alphabetical listings of suppliers, a product breakdown in over 200 categories and a geographic listing of suppliers.

The Underground Buying Guide is available by direct mail from PMS Publishing, 12625 Lido Way, Saratoga, CA 95070. The price is $5.95 plus 55¢ postage and handling. Californians add 39¢ sales tax. Moneyback guarantee within 10 days if you are not completely satisfied.



A Z80 Plug In

Circle No. 21 on Inquiry Card

You can have Z80 power for the S-100 BUS without getting rid of your CPU card. *Dutronics* a leader in low cost, low power RAM boards has just announced its Z80-80 piggy back card. This plug-in board enables you to use your existing IMSAI, Altair, or BYTE CPU card and upgrade your system to a Z80.

The card design is such that all you do is pull out your 8080 and 8212 chips, plug in the board to the 8080 socket itself and the ribbon cable to the 8212.

A system monitor, on paper tape, is included with the board as well as a Z80 manual and theory of operation. Dutronics will also supply all additional software at no cost, when it becomes available, the price is $159.95 (assembled only), *off the shelf.* For more information write or call: R.H.S. Marketing, 2233 El Camino Real, Palo Alto, California 94306 (415) 321-6639.

This looks like a neat idea—are there any non-obvious drawbacks to partial replacement of CPU boards as new chips come out?

Continued to page 44

S-100 Crate Design Information Package

Circle No. 22 on Inquiry Card

The Objective Design crate information packet is a complete set of plans and specifications for building an S-100 compatible card file and power supply. The crate is of high quality, making use of standard, commercially available extrusions, card guides, and power supply components. The design is variable and can be adapted to any of the available S-100 motherboards.

The advantages of constructing a crate as opposed to buying one include: cost savings (the crate and power supply will cost approximately $150, assuming all major components are purchased in unit quantities); a sturdier crate; an easier to work with design; and opportunities for customizing.

More than just a set of plans, the packet discusses the crate design and its variations; the crate materials—what to get, sources, substitutes, costs; construction; the power supply—requirements and options, designs, parts; CPU and front panel options now available; etc.

The cost of the Information Packet is $19.95. Contact Objective Design, Inc., Box 20456, Tallahassee, FL 32304.

If some member would like to put one of these together and write an article on his experience, let us know and we'll get the packet.

Answers for Table of Combinations from page 38.

NAND: OUTPUT	NOR: OUTPUT
H	H
L	H
L	H
L	L

Helpful Hints, or What I Had To Learn To Build a Computer

Chips

By Tricia Wood

Last month I wrote about Ohm's law and a small amount of circuit theory. These subjects are kind of theoretical, but this month we touch earth a little more with a discussion of logic symbols used on diagrams.

The basis of understanding a computer system is to understand the basic components used in constructing the machine. The basic components that I am referring to are the integrated circuits, commonly known as "chips". Inside the chips are "gates" which control the flow of current from the inputs to the outputs of the chips. Voltage is applied to the given input of the chip, and, when using transistor-transistor logic (TTL) chips, voltage of 0 to 5 volts may be applied. TTL chips recognize two discrete levels of voltage. From 0 to about .8 volts is referred to as a low level of voltage, and about 2.4 to 5 volts is commonly known as a high level of voltage. So when an input to a gate is "high" this means that from 2.4 to 5 volts is being applied to it. Conversely, when the input is "low" it is being zapped with from 0 to about .8 volts. There are three basic kinds of gates: inverters, AND gates and OR gates. The following is an explanation of each of these basic gates along with their symbols as used on logic diagrams.

Inverters (NOT gates):

Logic Symbol:

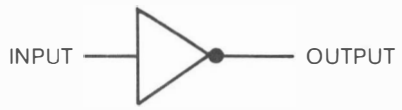


Table of Combinations:

INPUT	OUTPUT
HIGH	LOW
LOW	HIGH

Note that the table of combinations or "truth table" shows at a glance what the output will be for every possible input. An inverter essentially outputs the "opposite" level. If a high was input, then a low will be outputed and visa versa.

AND gates:

Logic Symbol:

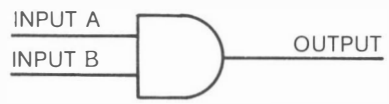


Table of Combinations:

INPUT A	INPUT B	OUTPUT
L	L	L
L	H	L
H	L	L
H	H	H

An AND gate is different than an inverter in that this one has two inputs with one output. Recall that the inverter had only one input with one output.

OR gates:

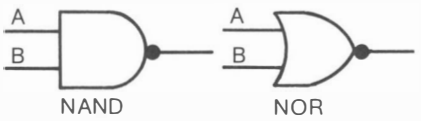
Logic Symbol:

Table of Combinations:

INPUT A	INPUT B	OUTPUT
L	L	L
L	H	H
H	L	H
H	H	H

This OR gate also has two inputs and one output just like the AND gate does.

These three gates may be combined to form other, more complex functions. There are two common ones formed in this way. They are NAND gates and NOR gates. They have the following symbols:



A NAND function may be achieved by taking the output of an AND gate and using it as an input to a NOT gate. A NOR function is achieved in much the same way but the output of an OR gate is fed into a NOT gate in this case. As an exercise, see if you can fill in the table of combinations for these two new functions—NAND and NOR. The answers can be found on page 37

NAND:

INPUT A	INPUT B	OUTPUT
L	L	____
L	H	____
H	L	____
H	H	____

NOR:

INPUT A	INPUT B	OUTPUT
L	L	____
L	H	____
H	L	____
H	H	____

Chips with these logic gates built into them cost only a few cents. Usually one goes by the number on the chip to identify them and that is what I will do here. A 7404 chip has NOT gates on it; a 7408 chip has AND gates on it. The 7432 chip has OR gates. It's fun to fool around and experiment with these chips and to see what kinds of outputs you can get when given inputs are applied to the chips. Once you have acquired the chips mentioned above, all you need is a 5 volt power source and some kind of instrument (a cheap voltmeter will do) to read the voltage on the outputs. Some suggestions for experimentation would be:

1. Smash a chip open with a hammer and see what is inside.

2. Apply voltage to the input of a chip and see if you read the correct output voltage as specified on the corresponding table of combinations.

3. Using a NOT chip and an AND chip, prove to yourself that the answers are correct for the table of combinations of NAND function that you filled in.

4. Repeat # 2 only this time use an OR chip to prove your answer to the NOR function table of combinations.

Further Reading:

1. *The Best Logic Yet (TTL)* by William Browning, 73 Magazine, August, 1975. An excellent place to begin.
2. Books of IC experiments available at Radio Shack Stores. Pick up a few chips while you are there and *experiment.*
3. *The TTL Cookbook* by Don Lancaster. A beginner will find some things he/she doesn't understand, but re-read it in six months. An excellent book, which is available at most computer stores.

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- As the Coordinator/Moderator

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- Floppy Disc Systems for Personal Computers
- Computer Games: Alphanumeric & Graphic
- Computers & Systems for Very Small Businesses
- Personal Computers for the Physically Handicapped
- Personal Word-Processing Systems
- Software Design: Modularity & Portability
- Personal Computers for Education associated with a Univ. of California short-course
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- Community Computer Center
- People's Computer Company

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Circle No. 26 on Inquiry Card

Games and Things

By Phil Feldman and Tom Rugg

Well, we held out as long as we could. In the past, our columns have been written in such a way that they should have been of interest to just about anyone with access to a computer that handles BASIC, as well as people who are just interested in games. Even if you don't have MITS BASIC, the programs we've published shouldn't be too hard to convert to some other version of BASIC, or even to FORTRAN or whatever else you may have available.

Also, of course, the columns we've written that present general discussions on how to create your own game program (Star Trek, Backgammon, etc.) were meant to provide food for thought to just about any computer hobbyist.

This month is a little different. Although just about anybody with a color graphics display could come up with a similar program to the MANDALA program we're showing you this time, it's going to be a lot harder to make the conversion if you don't have an 8080 based system with sense switches and a Dazzler (from Cromemco). But if you have such a system, you're about to get a genuinely dazzling program.

But, even if you have some other kind of graphics display (or are dreaming about what you could do if you *did* have one), the options that MANDALA uses to alter its video display should give you a good idea about how the flexibility of a program can greatly enhance its appeal.

The Authors of Mandala

MANDALA was written by Danny Kleinman and Steve Grumette. They're the same ones who created the backgammon machine ("JACK GAMMON") which is featured in both this month's and last month's issues of SCCS Interface. In fact, the kaleidoscope-like display of MANDALA is displayed to entertain (and attract) users of their backgammon machine between games.

Danny and Steve have entered their creation in the PCC Dazzler contest, hoping to win some loot with it. Results were not yet available at the time of this writing.

What Does It Do?

If everything works out as we hope, you'll be able to see what MANDALA does by looking at the cover of this magazine. We took a bunch of pictures of the Dazzler display when we saw the incredibly beautiful and complex color patterns it was generating. Unfortunately, still pictures can't convey the effect of motion and rhythm that the eye sees as one pattern after another is generated, starting as a point in the center of the screen and spreading toward the edges.

It's a fascinating, almost hypnotic display. And, as we'll explain below, it's programmed to do different things as you alter the sense switches. That's one thing that sets this program apart from other "kaleidoscope" programs we've seen for the Dazzler—this one has flexibility (via the sense switches) to prevent it from becoming boring.

The other unusual feature is that the display from this program has eight point symmetry. Most other such programs have only four point

symmetry, meaning that the image on the screen is symmetrical only about the vertical and horizontal axes. MANDALA produces patterns which are *also* symmetrical about the two diagonals. So, instead of looking like four mirror images, the display is a more complex pattern of eight mirror images. As a result, it looks a lot more like a real kaleidoscope.

What Do The Sense Switches Do?

Each of the eight sense switches has a different effect on the way the display is created. So, by combining the switch settings in different ways, a great deal of variety can be produced. The following explanations were provided by Danny and Steve.

Switches 8 and 9
With both switches 8 and 9 down, every pattern contains exactly 2 different colors. The colors selected are chosen at random and vary from one pattern to the next. With switch 8 up and 9 down, every pattern contains from 2 to 4 different colors. The exact numer of colors used in each pattern is chosen at random and varies with each pattern. With switch 8 down and 9 up, every pattern contains from 2 to 8 different colors. With both switches 8 and 9 up, every pattern contains from 2 to 13 different colors. (The Dazzler can produce a total of fifteen different colors, but they eliminated black and gray in their program.)

Switch 10
With switch 10 down, each pattern consists of 4096 separate squares of various colors (64 by 64). If switch 10 is raised, each square becomes four times as large in area and a total of only 1024 squares fill the screen (32 by 32).

Switch 11
With switch 11 down, the moving boundary between each two successive patterns has the shape of a cross. With switch 11 up, the boundary is square.

Switch 12
With switch 12 down, each new pattern starts in the center of the screen and expands toward the edges. With switch 12 up, patterns start at the edges and converge to the center.

Switch 13
With switch 13 down, the distribution of colors within each pattern is chosen at random (except that eight point symmetry is always maintained). If switch 13 is up, the color of each point in the display is selected according to simple mathematical rules which are varied from one pattern to the next. The use of these rules causes the designs to have a more "regular" appearance than those in which the colors are chosen at random, while retaining enough variety to make them interesting.

Switches 14 and 15
Switches 8 through 13 behave as described above only if switches 14 and 15 are down. If switch 14 is raised, the program enters a mode called "SPARKLER" in which the various points of the display change color at random (again, in groups of eight to maintain symmetry) instead of being "painted" out in an expanding or contracting motion. In this mode, each point may be one of the thirteen allowable colors, and the only other sense switches which alter the display are switch 10 (which has the same effect as previously described) and switch 15. If switch 15 is raised, the program will pause when it completes the painting of the current pattern and continue displaying that pattern as long as the switch is up. The painting resumes when the switch is lowered. In SPARKLER mode, the image freezes as soon as switch 15 is raised and continues when it is lowered.

The Mandala Program

The MANDALA program is written in assembler language. The listing of the program is 352 statements long—more than we have room to reproduce here, unfortunately.

Instead, we're going to try a different approach to publishing this program, and we'd like to hear your reaction to this approach. We're printing a hex dump of the program here in the magazine, and we'll give you a chance to send for a full assembler listing (plus comments) for the cost of duplication and a self-addressed stamped envelope.

The reasoning behind this is pretty simple. The full assembler listing would take up a great deal of space in the magazine. The hex dump, however, doesn't take up much space and gives the opportunity to those who have a Dazzler to use the program immediately (following a pretty lengthy session of entering the program into the computer, of course). Additionally, those of you who take delight in figuring out what a program is doing can have a great time digging into the dump.

As we said, this is experimental. You may use the *fast feedback poll* to let us know how you feel about things like this.

Anyone who would like the full assembler listing should send thirty cents and a self-addressed stamped envelope (with two stamps, to be safe, and a full sized letter envelope) to Box 5429, Santa Monica, CA 90405.

If you'd rather, you can buy a paper tape and six page documentation package for twenty dollars at the Computer Store in Santa Monica (See pg.10). They can demonstrate it for you, too.

Figure 1 is the hex dump of the program, and Figure 2 is a brief description of some of the main routines, in case you'd like to take a stab at figuring some of it out.

```
0000 21 0D 03 11 00 00 0E 00 1A 77 13 23 0C C2 08 00
0010 31 FF 03 21 00 04 7C 0F C6 80 D3 0E 3E 30 D3 0F
0020 DB FF 32 E7 02 17 DA 20 00 17 DA A3 02 3A E5 02
0030 C6 02 E6 0F 32 E5 02 21 EA 02 97 0E 0E 77 23 0D
0040 C2 3D 00 CD 54 02 32 E8 02 CD 54 02 21 E8 02 BE
0050 CA 49 00 32 E9 02 3A E7 02 E6 03 CA 6C 00 3C FE
0060 02 CA 6C 00 B7 FE 06 CA 6C 00 C6 05 32 F8 02 3A
0070 F8 02 3D 32 F8 02 FA 90 00 CD 54 02 21 E8 02 BE
0080 CA 90 00 4F 7E B7 23 79 C2 7F 00 2B 77 C3 6F 00
0090 11 E8 02 21 E8 02 97 BE CA 9F 00 23 C3 97 00 1A
00A0 77 13 23 97 BE CA 9F 00 3E 1F 32 07 03 3A E7 02
00B0 E6 04 CA BC 00 3E 0F 32 07 03 3E 01 32 01 03 3A
00C0 E7 02 E6 10 CA D2 00 97 32 FB 02 3C 32 F9 02 C3
00D0 DC 00 3D 32 F9 02 3A 07 03 32 FB 02 21 FB 02 3A
00E0 07 03 96 32 FA 02 3A E7 02 E6 08 CA FD 00 3A 07
00F0 03 32 FC 02 3A FB 02 32 FD 02 C3 06 01 32 FD 02
0100 3A FB 02 32 FC 02 3A E7 02 E6 10 CA 1C 01 3A FC
0110 02 4F 3A FD 02 32 FC 02 79 32 FD 02 CD 47 01 3A
0120 FC 02 21 FD 02 BE CA 33 01 21 F9 02 86 32 FC 02
0130 C3 1C 01 3A FB 02 21 FA 02 BE CA 20 00 21 F9 02
0140 86 32 FB 02 C3 E6 00 CD 65 02 E6 0F 21 E8 02 4F
0150 06 00 09 7E 32 00 03 3A E7 02 E6 04 C2 04 02 2A
0160 FB 02 22 FE 02 CD 86 01 3E 3F 21 FB 02 96 32 FE
0170 02 CD 86 01 3E 3F 21 FC 02 96 32 FF 02 CD 86 01
0180 3A FB 02 32 FE 02 CD 89 01 3A FE 02 4F 3A FF 02
0190 32 FE 02 79 32 FF 02 21 00 00 3A FF 02 84 07 07
01A0 17 D2 A7 01 26 04 3F 17 D2 AC 01 24 11 00 04 6F
01B0 19 22 02 03 21 00 00 3A FE 02 6F 22 04 03 3A 01
01C0 03 32 06 03 97 85 1F DA CF 01 06 F0 C3 D2 01 06
01D0 0F 3F 6F 07 07 07 17 D2 DE 01 11 F0 01 19 EB 2A
01E0 02 03 19 7E A0 4F 3E F0 B8 3A 00 03 CA F3 01 07
01F0 07 07 07 81 77 3A 06 03 3D F8 2A 04 03 23 22 04
0200 03 C3 C1 01 CD 07 02 3A FB 02 4F 3A FC 02 32 FB
0210 02 79 32 FC 02 2A FB 02 29 22 FE 02 CD 4A 02 3E
0220 1F 21 FC 02 96 87 32 FF 02 CD 4A 02 3E 1F 21 FB
0230 02 96 87 32 FE 02 3A FC 02 87 32 FF 02 CD 4A 02
0240 3E 1F 21 FC 02 96 87 32 FF 02 CD 97 01 21 FF 02
0250 34 C3 97 01 CD 7F 02 E6 0F CA 54 02 FE 07 D8 FE
0260 09 D0 C3 54 02 3A E7 02 E6 20 CA 7F 02 3A E6 02
0270 21 E5 02 86 FE 11 DA 7B 02 D6 11 32 E6 02 C9 2A
0280 08 03 7C 3C CA 91 02 3A 0C 03 BC DA 94 02 CA 94
0290 02 21 FF 0B 2B 22 08 03 3A 0A 03 96 17 95 1F 32
02A0 0A 03 C9 CD 54 02 32 00 03 3A E7 02 E6 04 CA CC
02B0 02 3E 01 32 01 03 CD 7F 02 E6 0F 32 FB 02 CD 7F
02C0 02 E6 0F 32 FC 02 CD 04 02 C3 20 00 32 01 03 CD
02D0 7F 02 E6 1F 32 FB 02 CD 7F 02 E6 1F 32 FC 02 CD
02E0 5F 01 C3 20 00 01 00 00 00 00 00 00 00 00 00 00
02F0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0300 00 00 00 00 00 00 00 00 FF 0B 00 00 00 00 00 00
```

Figure 1: Hex dump of MANDALA program

Hex Address	Description
0000	Program start. Loop to fill 030D to 040C with 00 through FF.
0010	Initialize stack pointer. Turn on Dazzler, which uses memory locations 0400 through 0BFF.
0020	Test sense switches 15 and 14 for stopping display and SPARKLER.
0043	Pick first color in scheme.
0049	Pick second color in scheme.
0056	Test sense switches 8 and 9 for color complexity.
006F	Pick additional colors.
00A8	Test sense switch 10 for square size.
00BF	Test sense switch 12 for inward-outward movement.
00E6	Loop to paint frame in groups of eight squares placed symmetrically.
0147	Start of eight-square subroutine.
0254	Start of random color picking subroutine.
027F	Start of random number subroutine.
02A3	Start of SPARKLER routine.
02E4	End of instructions.
02E5	Start of work areas.
0400	Start of Dazzler display image.
0BFF	End of Dazzler display image.

Figure 2: Key addresses in MANDALA program

New Products *Continued from page 37*

Add A Calculator Chip to Your Micro

Circle No. 29 on Inquiry Card

Now you can have full floating point calculations without using a lot of memory. With the RSG Electronics mathematical function unit printed circuit board, you get not only the standard add, subtract, multiply and divide, but a full 40 function floating point calculator array. Unique features include: Complete compatibility with any computer having one TTL level I/O port. Straightforward programming using I/O commands. Speed approximating and often better than software equivalents. Special functions may be programmed to operate independent of further processor control. Built-in overflow and error detection. A high quality board with through hole plating and gold plated fingers together with clear and complete instructions.

The cost of the board only is $24.95 and the complete kit is $59.95. For further information contact RSG Electronics, P.O. Box 13, Santa Margarita, CA 93453.

Note that this looks like an I/O device to the programmer, it does not extend the instruction set.

Eliminate Micro-Processor Interference

Circle No. 30 on Inquiry Card

Most personal computer systems create a lot of radio interference. Microprocessors, control circuitry, switching power supplies, teletypes, paper punches—all generate interference across the entire R-F spectrum.

Your wife or mother-in-law may have trouble with TV, FM, AM radio or stereo. You may interfere with your neighbor's CB. Maybe you're interfering with The Fuzz' 2-way radio.

The just announced equipment line filter (ELF and ELF/T) series will keep your equipment hash off the power line. As a bonus, interference already on the power line is kept out of your rig. The ELF/T line filter has a built-in transient suppressor to protect equipment against line surges and other transient phenomena.

Prices range from $3-$16.50. For further information, contact Electronic Specialists, Inc., 171 South Main Street, Natick, Mass. 01760 (617) 655-1532.

Tiniest Trek

by Frank McCoy

The January *Interface* featured the smallest higher level language we'd seen: VTL/2. VTL/2 was designed by Gary Shannon and Frank McCoy and they first implemented it on the 6800. Since that time, Frank has implemented an 8080 version (with a bit of help from Steve Zook).

Frank has written a Startrek program in VTL/2 which demonstrates the power of the language. The listing is very well commented, but you will probably need to refer to Gary's article in the January issue in order to follow it completely. Frank also points out two language characteristics which were not stressed in Gary's article: the relational operator ">" is interpreted as greater than *or equal* and all integers are treated as 16 bit *positive* numbers, so you have to keep track of signs yourself if negative results are possible.

Frank has been into electronics since age 9 and is very knowledgeable on both the 6800 and 8080. He is an R&D engineer at Tape Athon and, of course, a member of SCCS.

```
                    *MINI-TREK*
                BY FRANK MCCOY 1/7/77

10 ?=""                          PRINT A CARRIAGE RETURN-LINE FEED
20 ?="          *MINI-TREK*"     PRINT HEADING
30 W=%/2500+10                   SETUP NUMBER OF KLINGONS (10-36)
40 D=8-(%/6000+31*W/19)          SETUP NUMBER OF STARDATES
50 L=10000                       SET INITIAL ENERGY TO 10000
60 X=0                           INITIALIZE LOOP COUNTER
70 S=10                          POINT STARBASE OUTSIDE OF QUADRANT
80 T=10                            "      "      "     "
90 A=0                           INITIALIZE KLINGON COUNTER
100 X=X+1                        POINT TO NEXT SECTOR IN QUADRANT
110 :X)=0                        CLEAR SECTOR
120 #=X<64*100                   HAVE ALL 64 SECTORS BEEN CLEARED?
130 X=1                          RESET LOOP COUNTER
140 #=%/13*8+%>2*170             PROB.  OF 2 IN 13 OF A STAR OR KLINGON
150 :X)=%/5*8+%=8*(A<W)+1        PROB OF 1 IN 5 OF STAR BEING KLINGON
160 A=:X)=2+A                    IF KLINGON THEN INCREMENT COUNTER
170 X=X+1                        INCREMENT SECTOR COUNTER
180 #=X<65*140                   SEE IF ALL 64 SECTORS HAVE BEEN SETUP
190 X=%/64*8+%+1                 POSITION ENTERPRISE AT RANDOM
200 :X)=3
210 E=X-1/8                      SAVE SECTOR COORDINATES
220 F=%+1
230 #=%>20000*290                PROB.  OF A STARBASE APPROX 1 IN 4
240 J=%/64*8+%+1                 POSITION STARBASE AT RANDOM
250 #=J=X*240                    DO IT AGAIN IF ENTERPRISE IN SAME PLACE
260 :J)=4
270 S=J-1/8                      SAVE STARBASE COORDINATES
280 T=%+1
290 C=S<E*(E-S)+(E<S*(S-E))      FIND OUT HOW CLOSE THE ENTERPRISE
300 G=T<F*(F-T)+(F<T*(T-F))      IS TO A STARBASE
310 Q=C<2*(G<2)                  IF CLOSE ENOUGH ENTERPRISE IS DOCKED
320 D=D+1                        INCREMENT STARDATE
340 L=Q*10000+(Q=0*L)*(L<10001)  SET ENERGY IF DOCKED OR ENERGY IS NEG.
350 ?=""                         PRINT CRLF
370 ?="##########"               PRINT TOP BORDER OF SCAN
380 X=1                          INITIALIZE LINE COUNT OF SCAN
390 K=0                          SET UP TO COUNT KLINGONS
400 J=1                          INITIALIZE COLLUMN COUNT
420 ?="#";                       PRINT LEFT BORDER
430 C=:X-1*8+J)                  FIND OUT WHATS IN THAT SECTOR
440 $=C*14+32+(C=2*15)-(C=3*5)-(C=4*22)   PRINT SPACE,.,E,B,OR K
450 K=C=2+K                      INCREMENT IF KLINGON
460 J=J+1                        NCREMENT SECTOR
470 #=J<9*430                    IF NOT LAST IN ROW THEN GET NEXT
480 ?="#  ";                     PRINT RIGHT BORDER
490 #=X<4*750                    FIRST FOUR LINES BLANK
500 #=X>5*(X*30+400)             PRINT THE APPROPRIATE DATA FOR EACH LINE
510 ?="SECTOR    ";              PRINT THE SECTOR NUMBER
520 ?=E+1
530 ?=F
540 #=750
550 ?="STARDATE  ";              PRINT THE STARDATE
```

```
560 ?=D
570 #=750
580 ?="ENERGY     ";              PRINT THE ENERGY REMAINING
590 ?=L
600 #=750
610 ?="KLINGONS   ";              PRINT THE # OF KLINGONS REMAINING
620 ?=W
630 #=750
640 ?="CONDITION ";               PRINT THE CONDITION (RED, GREEN, ETC.)
650 #=Q*690                       IF DOCKED
660 #=K=0*710                     IF NO KLINGONS IN VICINITY
670 ?="RED";                      IF KLINGONS ARE PRESENT
680 #=750
690 ?="DOCKED";                   IF NEXT TO A STARBASE
700 #=750
710 #=L<2000*740                  IF ENERGY IS LOW GOTO 740
720 ?="GREEN";                    IF NO KLINGONS IN QUADRANT
730 #=750
740 ?="YELLOW";                   IF ENERGY IS LOW
750 ?=""                          PRINT A CRLF
760 X=X+1                         INCREMENT LINE NUMBER
770 #=X<9*400                     IF NOT LAST LINE THEN REPEAT
780 ?="###########"               PRINT BOTTOM BORDER OF SCAN
790 ?=""                          PRINT CRLF
800 #=K=0*840                     IF NO KLINGONS PRESENT THEN SKIP NEXT
810 H=(/250*K                     FIND OUT HOW HARD YOU GOT ZAPPED
820 ?=H                           PRINT THE VALUE
830 ?=" UNIT HIT FROM KLINGONS"   PRINT MESSAGE
835 L=L-H                         SUBTRACT VALUE OF HIT FROM ENERGY LEFT
840 #=W=0*1190                    IF NO KLINGONS LEFT THEN YOU WON
850 #=D=0+(:E*8+F)=0)+(L-1>10000)>1*1210   SEVERAL WAYS TO LOSE
860 ?="COMMAND? ";                PROMPT
870 A=?                           INPUT THE COMMAND #
880 #=A-1>3*860                   IF ILLEGAL COMMAND THEN REPEAT
890 #=A>2*(A*20+940)              GOTO APPRORIATE COMMAND ROUTINE
900 #=1060                        GOTO THE SECTOR SUBROUTINE
910 #=:O)>1*900                   YOU CAN'T JUMP WHERE SOMETHING IS
920 :E*8+F)=0                     YOU ARE NO LONGER THERE
930 :O)=3                         YOUR NEW LOCATION
940 E=M                           SAVE NEW COORDINATES
950 F=N                             "   "
960 L=L-G                         SUBTRACT ENERGY NEEDED TO MOVE
970 #=290                         PRINT OUT NEW MAP
980 L=L-((/250+300)               LESS ENERGY TO MOVE TO A NEW QUADRANT
990 #=60                          SETUP NEW QUADRANT
1000 #=1060                       GOTO THE SECTOR SUBROUTINE
1010 #=(<7800*1040                RANDOM MISS
1020 W=W-(:O)=2)                  IF ITS A KLINGON THEN ONE LESS KLINGON
1030 :O)=0                        WHATEVER IT WAS IT'S DEAD
1040 L=L-(G*2)                    SUBTRACT ENERGY NEEDED TO SHOOT
1050 #=290                        PRINT OUT NEW MAP
1060 ?="SECTOR? ";                SECTOR SUBROUTINE
1070 M=?/10-1                     INPUT COORDINATES
1080 N=%
1090 O=M*8+N                      FIND WHERE THEY ARE IN THE ARRAY
1100 #=O-1>64*840                 RETURN TO COMMAND IF ILLEGAL COORDINATES
1110 C=M-E*(M-E)+(N-F*(N-F))*100   SUM OF SQUARES OF TWO DISTANCES
1120 R=!                          SAVE RETURN ADDRESS
1130 G=C/10                       SETUP FOR SQUARE ROOT
1140 #=G=0*R                      RETURN IF ZERO DISTANCE
1150 J=G                          SAVE APPROXIMATION
1160 G=C/G+G/2                    CALCULATE SQUARE ROOT
1170 #=G<J*1150                   IF NEW APPROXIMATION IS BETTER THEN CONT
1180 #=R                          RETURN
1190 ?="YOU WIN!!"                IF YOU WON
1200 #=1220                       SKIP NEXT
1210 ?="YOU LOSE!"                IF YOU LOST
```

THIS MINI VERSION OF STARTREK HAS ONLY THREE COMMANDS:

1. MOVE TO A DIFFERENT SECTOR
2. MOVE TO A DIFFERENT QUADRANT
3. FIRE AT A GIVEN SECTOR

NOTES: THE FURTHER YOU MOVE OR THE FURTHER AWAY YOUR TARGET THE MORE ENERGY IT TAKES

IF YOU RUN OUT OF STARDATES OR ENERGY YOU LOSE

IF YOU ZAP YOURSELF, YOU LOSE

NOT ALL QUADRANTS HAVE STARBASES IN THEM

A SAMPLE PRINTOUT LOOKS LIKE THIS:

```
###########
#.    ..  #
#  K      #
#  E   .  #
#     .   #  SECTOR    33
#KK   .   #  STARDATE  65437
#         #  ENERGY    5736
#   B   .#  KLINGONS  15
#..       #  CONDITION RED
###########

586 UNIT HIT FROM KLINGONS
COMMAND?
```

Book Reviews

Ron Carlson, editor

Well, here I am. The volunteer for book review editor. To introduce myself; my name is Ron Carlson, I'm a UCLA graduate student in Computer Science, a Sr. Tech/Programmer, an avid amateur computerist, and member of SCCS. I see great potential as book review editor to make available sources of needed information, from both common and obscure sources, to personal computing. I have several bibliographies built up including compiler construction, character recognition, robotics (especially manipulators), operating systems, analog circuits, games (checkers, chess, monopoly), and artificial intelligence.

Of course to be able to get this kind of thing going steadily I estimate that we'll need about 10 reviews in the works at any one time, allowing 4-5 weeks for each review to be completed. I will be requesting reviewer's copies of books when not available elsewhere and hope to arrange for the reviewer to keep the copy they reviewed. We need all you interested computer buffs, pros, and beginners to write for the "Reviewer's Info Sheet"! Ron Carlson, P.O. Box 5429, Santa Monica, CA 90405.

Computer Clippings
Stephen J. Rogowski, 1976
Creative Publications, Palo Alto, CA 94303, 8½ x 11, 250 pgs, paper $ Reviewed by Ron Carlson.

Every once in a while a book emerges from the masses bursting with creativity and fun that dazzles my imagination and evokes some regret over countless shelved projects. *Computer Clippings* is one of these books.

The book touches various areas in academic mathematics; numbers, probability, polar and rectangular trig functions, conic sections, trig identities, linear regression, and lots more. There are some 46 algorithms, mostly in BASIC or else in FORTRAN, to generate interesting and perhaps useful outputs.

Do you remember that last perfect number you met? or at least the amicable one? Huh?...Before you go too far astray, let me explain. A perfect number is one whose divisors (excepting itself) add up to itself. Try 6 or 8. Amicable numbers are not perfect numbers but succeed in adding up to themselves after several cycles. That is, 220 is an amicable number since the sum of its divisors is 284. Now the sum of the divisors of 284 is 220; so 220 is amicable in 2 cycles. 14,316 has 28 cycles, and some numbers never converge. "Number Cycles" lists a BASIC program to search for such cycles. Perhaps necessary only to a mathematician, but I can't help wondering what a plot of the error value vs. each integer to, say, 1,000 for perfect numbers might look like. A random scatter? A pattern? Some interesting result?

Is your age a happy number? You say "Why not ask me if *I'm* happy with my age?". Well, to answer the first question take a number, say 28. Sum the squares of its digits, and sum the squares of the resulting number's digits, in a continuing sequence until you either get "1" or an infinite loop. "Happy Numbers" will keep your BASIC busy for a while (28 is a happy number so I'm off the hook.)

Do you happen to know the *exact* value of 400 factorial? Think you might want to know? Want to see if you don't want to know? Try "Exact Values..." or just look in the appendix. You can get any factorial from 1 to 400 here. I'll leak this much; 400 factorial is 869 digits long!

If you needed 10 nested bifoliums where would you go? The local bird breeder? The aspirin? Try Section 4, its got some neat graphics programs, including those bifoliums, and of course the classic "Polygon Diagonals" plot. Spectacular!

And if all else fails to excite you, run "Signs". Works on your TTY or lineprinter. Makes any three line sign in almost any of the 64 ASCII characters (8 x 20 matrix). Line lengths can be arbitrarily long! Perfect for personalized wallpaper.

There are lots more programs worth mentioning and a 144 page appendix too. Written at an easy level, plenty of room for your imagination. This one will keep you up nights!

What To Do After You Hit Return
People's Computer Company & Hewlett-Packard Co., 1975, Nowels Publications, Menlo Park, CA 94025, 11x14½, 158 pgs, paper $6.95. Reviewed by Ron Carlson.

Here's a conspicuous book that's full of games written in HP 2100F BASIC. I read it before I had access to BASIC and found it intriguing. It entails a potpourri of games, comments, printouts, sample runs, and humorous artwork. There are ten major sections of games: number guessing, words, Nimlike puzzles, 2-D hide & seek, Patterns, board games, caves, business & social simulations, science fiction, and miscellaneous.

Many of the more popular and exciting games are included like Hangman, Nim, Life, Qubic, Biorhythms, Gomoku, Hamurabi (Lord Baron), Startrek, and Lunar Lander.

There's a clear and easy investigation into the algorithms for Nim with references for more variations. I'm still trying to get the code of Fig. 4, pg 29 to execute, can anybody loan me a keyboard with the cartouche key working?

For all you Life lovers there's a nice discussion on John Conway's game and some patterns to try that you might have missed elsewhere.

Caves is fun too, but tell me, how could the "Spider from the Bottomless Pits" ever get out, and if it did, how do we know the pits are bottomless?

For those of you who aren't into computer games try Hamurabi, Startrek, or Qubic before you throw in the towel (printout?). Most of the games can be played well without any computer and are so starred in the Contents. Many have source listings in the book but some key ones don't. They are available from C.C.C. (a P.C.C. spin-off), H-P, and other sources as listed in the writeups for several dollars each (grump).

The book reads easy, but beware, some of the comments are subtlely loaded theoretical questions! A great book for weekend project ideas or just plain fun.

Unclassified

Each month SCCS Interface will devote this space to free, non-commercial advertising by members.

The only exception to this policy is in the case of ads seeking or offering employment. In such cases, the membership requirement is dropped.

To place your free ad, write or type your ad and mail to:
Karen Wolff,
P.O. Box 5429,
Santa Monica, California 90405

SALE: High Speed Printer nylon RIBBON, Honeywell H222, 14'x20 yds., never used: purple, green, red; slightly used: purple. A $120 to $160 value—all 4 for $70 plus shipping. J. Gindele. 3540 Yates Avenue North, Minneapolis, MN 55422, ph; (612) 537-9134 evenings.

FOR SALE: Altair 8800, working, hardly used, IC's in sockets, flat-cable to front-panel. $440 or offer.
TV typewriter, new, working, $110 or offer. Dennis Feucht, 2015 S.E. 51st Ave., Portland, OR 97215 (503) 233-2648 or (503) 644-0161, ext. 6255.

FOR SALE: Processor Technology 4K Static RAM assembled, works perfectly, meets all specs, with all documentation $150. Free unused papertape of 5K BASIC with documentation included. Barry Gerber, 720 Morse Ave., Placentia, CA 92670.

WANTED: MITS Altair Disc (88-DCDD) with Disc BASIC. Need not be in working condition, but must be complete. State age, condition, version BASIC, price and other particulars. Dana G. Peterson, 2129 Harper Street, Lawrence, KS 66044, (913) 841-2817.

FORSALE: Data General 1200 Jumbo. Full 32K with power fail, auto load, real time clock, TTY I/O. Also DG high speed paper tape reader and punch with I/O. Cherry condition. Purchased 1974. Might consider swap for airplane or whatever. Box 2488, Santa Maria, CA 93454. Tel. (805) 922-5765.

FOR SALE: 8080 Disassembler. Written in Altair 8K BASIC. Dump your programs in Assembler Format. $2 for paper tape and instruction sheet. 50¢ for just teletype listing. Chris Pettus, P.O. Box 611, Malibu, CA 90265.

WANTED: SWTP 6800 with or without CT-1024 Terminal. Joe, 51625 Chestnut Rd., Granger, IN 46530.

JOB OPPORTUNITIES: New Micro Computer Store needs part and full time help. Contact Mr. Woodring (213) 295-6743.

WANT: Back issues of *SCCS INTERFACE*. Need Dec. '75, Jan., Feb. and Mar. '76. Also need Sept., Oct., Nov., Dec. '75 and April '76 of *BYTE Magazine*. Send your asking price to Dick De Nicola, 516 Devanah St., Covina, CA 91722 (213) 685-6307.

TRADE AR-3 SPEAKERS, Fisher 800 B Tuner, Dual Auto Turntable for antique obstetrics and gynecology books or surgical instruments, teletypewriter, tape reader or whatever. Robert Scott, M.D., 11600 Wilshire Blvd., Los Angeles, CA 90025, (213) 477-7555.

FOR SALE: Magnetic circuit breakers. "Instant" action on-off switch. Heineman JA1B3 15 and 20 ampere. Have 100 total. New. Great for protecting high current low voltage circuits. $3 each or 2 for $5. Box 2488, Santa Maria, CA 93454.

PARTNER OR HELPER WANTED: interested in producing double-sided plated-thru hole printed circuit boards in my garage. Contact Dick Martin, 405 S. Ynez Ave., Monterey Park, CA 91754, phone (days) 625-4788, (eve.) 281-7540.

FOR SALE: PolyMorphic VTI/64 Video Module $200. Morrow's/Godbout Cassette Interface, fully expanded $120. Both working, with IC's socketed. PPD in USA. Shipped within 24 hrs. of receiving MO or certified check. Tom Burke, 150 Church St., Burlington, VT 05401.

FOR SALE OR SWAP: Two Phi-Deck tape players, one with electronics. Purchased Sept. 1974 for $189. Box 2488, Santa Maria, CA 93454.

WANTED: MITS BASIC 8K program commands. I am interested in MITS BASIC but would like to know what it can do first. Thanks. Roger Kloepfer, 7774 Brown Road, Parma, MI 49269.

FOR SALE: Sphere 340 System: 20K RAM plus 16K RAM board less mem. chips, 1K EPROM System Monitor. Full SIM board (1-cassette & modem). 80 column line printer with tractor feed. Duel floppy disk, 9" CRT in console. Large power supply, 4K EPROM board (1702A) no eprom chips. Software includes: Assembler, Editor, I/O Handler, Mem. Test, Disassembler. This system is ideal for program development. Working perfectly. $6,500.00 Wayne Smith: 227 So. State St., Salt Lake City, UT 84111 801/363-4941

Tapping Sources of Computer Experience

By Jim Carlstedt and Jim Levin, Associate Editors

The continuing trend toward functional integration and lower cost is likely not only to bring personal computers within reach of more pocketbooks, but also to make them more powerful, i.e., to take away the "micro". For this reason the most essential and lasting distinction between the mainstream field of computing and the personal computer "subculture" doesn't lie in the differences between types of computers, but rather between types of applications, and in the fact that the personal computer subculture is populated to a large extent by computer nonprofessionals.

Many of the concepts, principles, methods, and problems associated with computers are similar for computers, large or small, shared or private. Once we become involved with computers we find ourselves faced with many of the same kinds of challenges that have confronted computer engineers, programmers, and users for the past thirty years: correctness, convenience, reliability, and economy of hardware and software components and interfaces and of the tools used to develop and modify them. As most of us know, we are always—sometimes most urgently!—in need of helpful information.

We need information that helps us avoid "reinventing the wheel" in solving specific design or programming problems. We need information that helps us avoid misleading advice from other novices. We need information that enhances our own design and programming abilities. Finally, we need information that enables us to be aware of possibilities for our personal systems and applications and that helps us develop criteria for choosing among them.

This kind of information exists as part of the growing record of the computer field, in the form of books, papers, periodicals, films, etc. Following this note is a list of some of the topics covered. Some of these may be relevant to your own personal computer interests.

A disadvantage of being a computer non-professional is the difficulty of accessing this information. One isn't as likely to have privileges at a library where these publications are available or be willing to shell out for expensive books, subscriptions, or membership fees. And as a computer non-professional, one may not have as much time to read them or to learn the technical jargon sometimes necessary to understand them.

This is where INTERFACE can help. One of its goals is to relay relevant information from the computer field in the form of reprints, reviews, summaries, and tutorials, in as non-technical a vocabulary as possible.

This is where you can help INTERFACE. You can tell us which subjects are of most concern to you, selecting from the list of topics or suggesting additions to it.

Also, if you have a specific problem or question, write it down and send it in. If it appears to be of sufficiently wide interest, we'll print it, and if we can respond directly or point you to helpful information, we'll print that too.

Finally, we realize that the personal computer subculture includes a substantial number of persons who do have previous computer experience. If you are one such, you can help INTERFACE by scanning for, filtering, or interpreting relevant information from your areas of computer experience, and helping generate some of those reviews, summaries, and tutorials. We especially like short notes and comments. Start sending them in!

Topics Relevant to Personal Computing

Basic programming concepts
data types
storage structures & access methods — naming/addressing methods, scopes/ control structures

Programming methods & techniques
modular programming
structured programming
debugging & testing
program verification
input/output
exception handling
sorting
random number generation
numerical methods & functions
string processing
flow charting
programming style,
efficiency evaluation
program comments and documentation

Programming languages
machine-oriented languages
higher-level procedural languages
functional languages
data flow languages
problem-description languages

Program language processors
assemblers
compilers
interpreters
compilation vs. interpretation

Operating systems
file management
processes,
input/output
virtual memory
virtual machines
command languages
help systems
user profiles

Hardware
logic design
processors
storage
control units & interfaces
I/O devices

Computer architectures
processor-storage configurations
high-level-language computers
multiprocessing

Applications
text editing
personal data bases
information retrieval
communications
games
graphics
art
music
mathematics
instruction
control
speech processing
natural language processing

The computing field
history
organizations
conferences
publications

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Tapping Sources of

By Jim Carlstedt and Jim Levin, Ass

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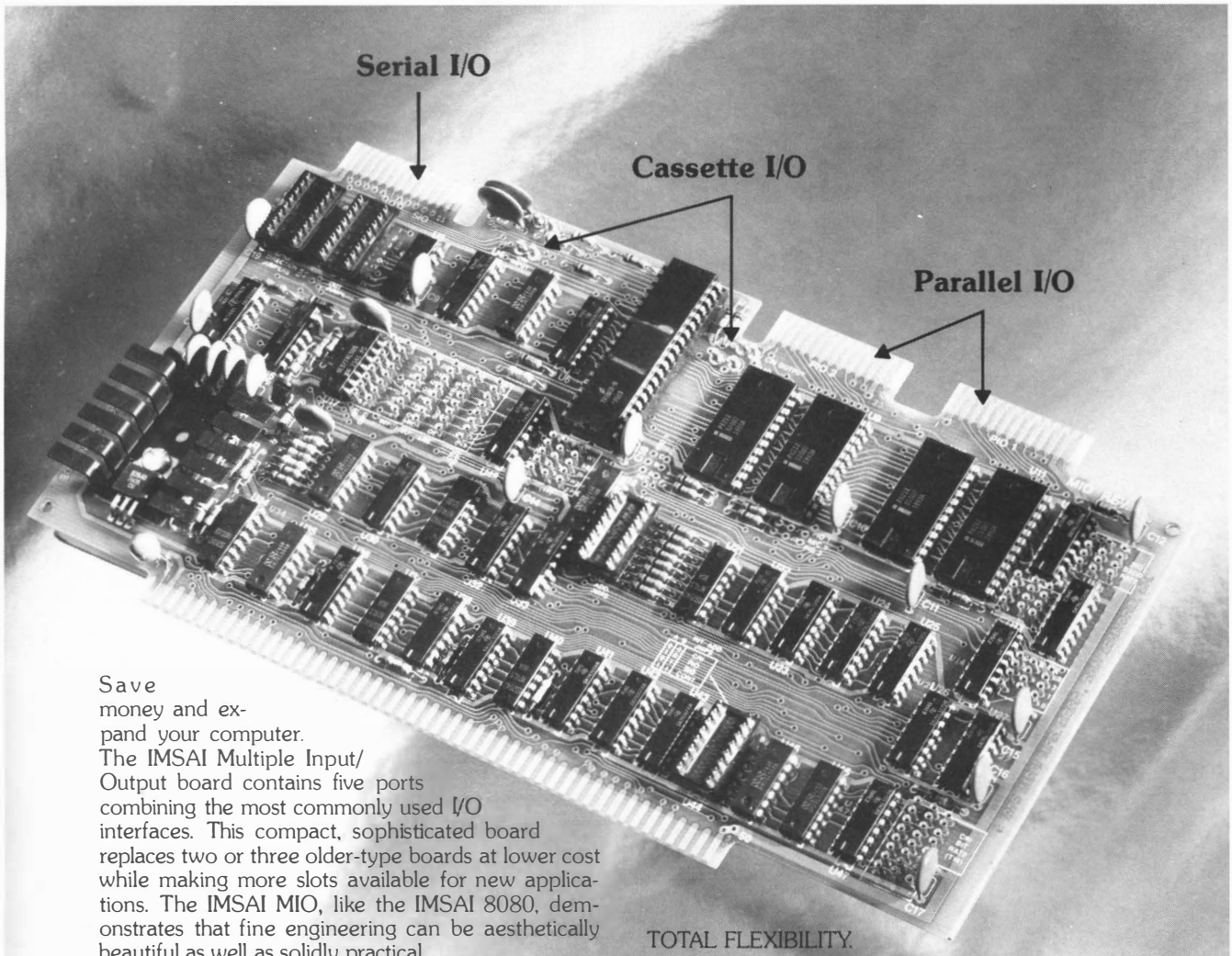

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Afford-ability:

Prices for the Altair 8800b start at $840.00 for a kit and $1100.00 for an assembled unit (all documentation included).

For a complete listing of prices on all Altair products and a free brochure, contact:

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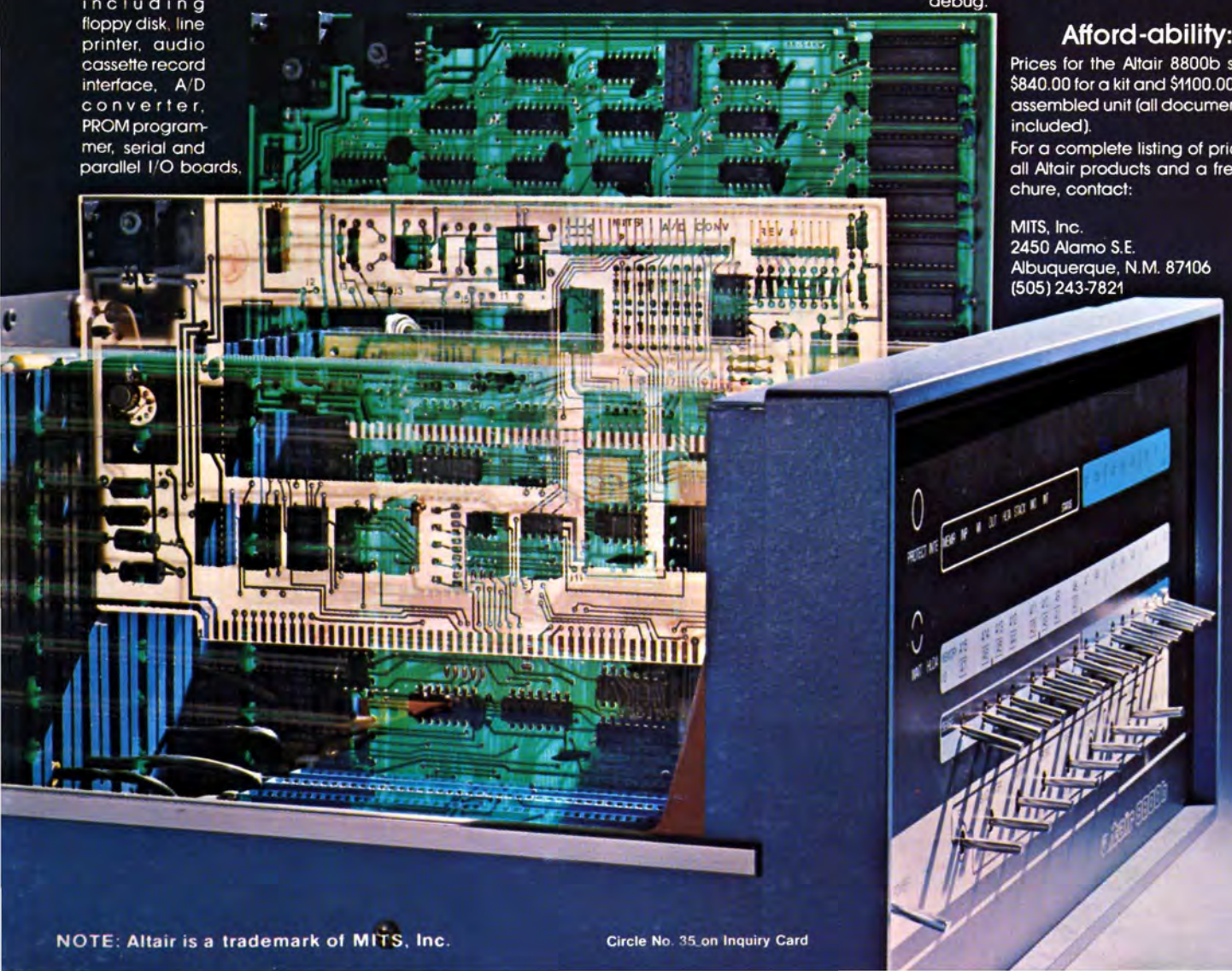

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